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TOOLING and PRODUCTION

The Magazine of Manufacturing Management

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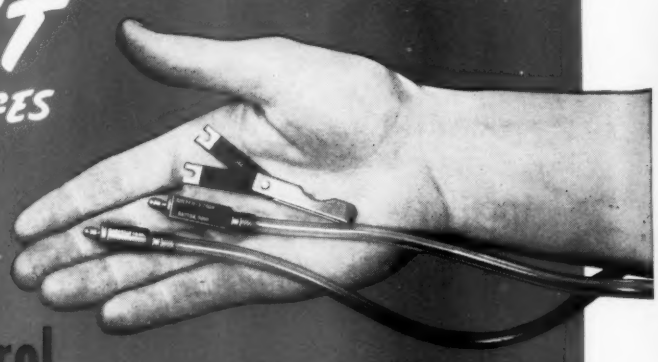
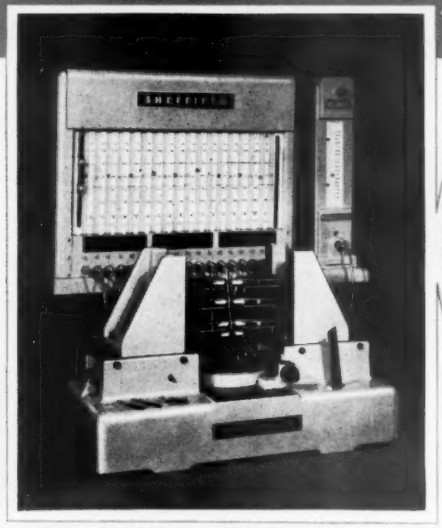
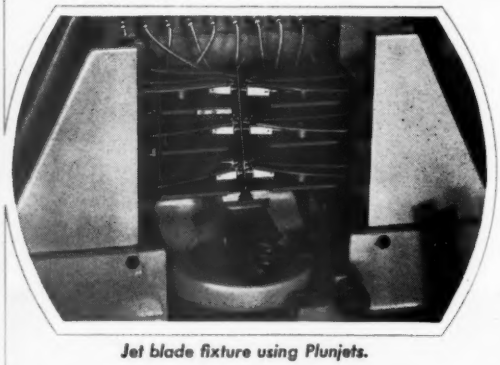


The Plunjet is made with both rectangular and cylindrical short and long housings.



Plunjets with Precisionaire for checking jet engine blades.



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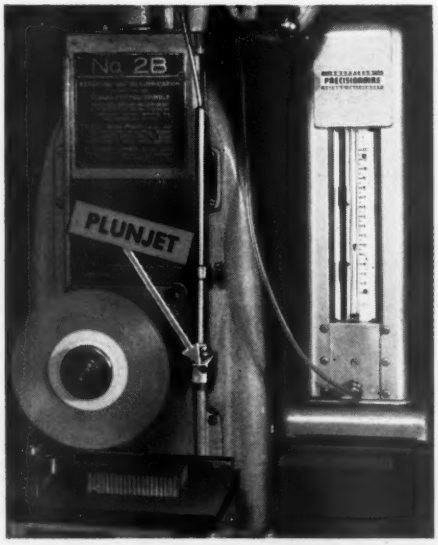

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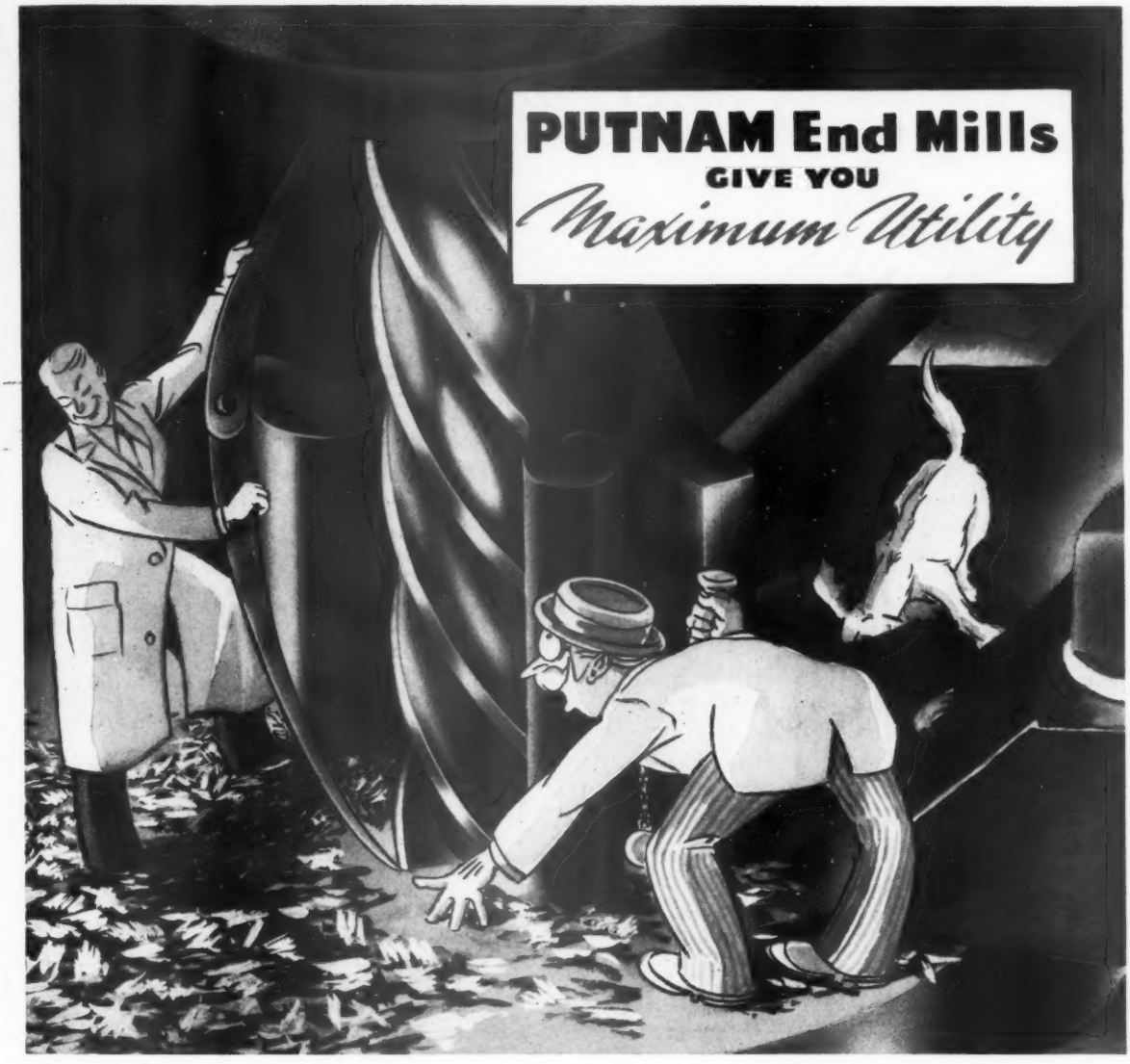

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Vol. XIX—No. 5 August, 1953

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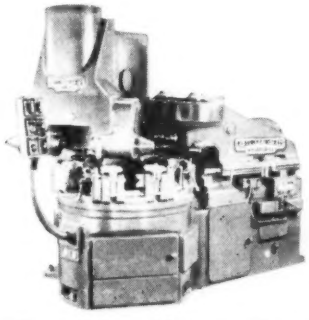

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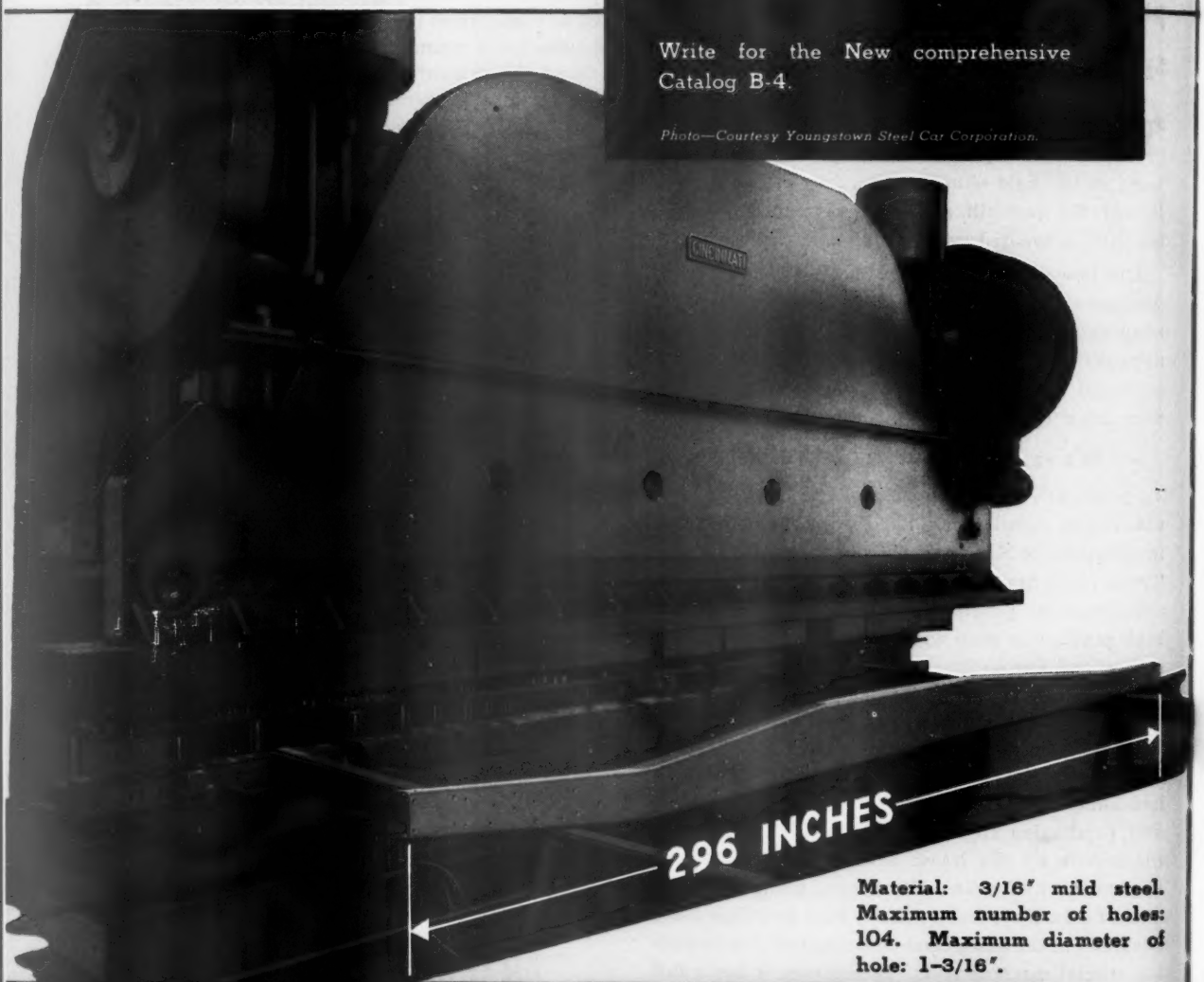

Material: 3/16″ mild steel. Maximum number of holes: 104. Maximum diameter of hole: 1-3/16″.

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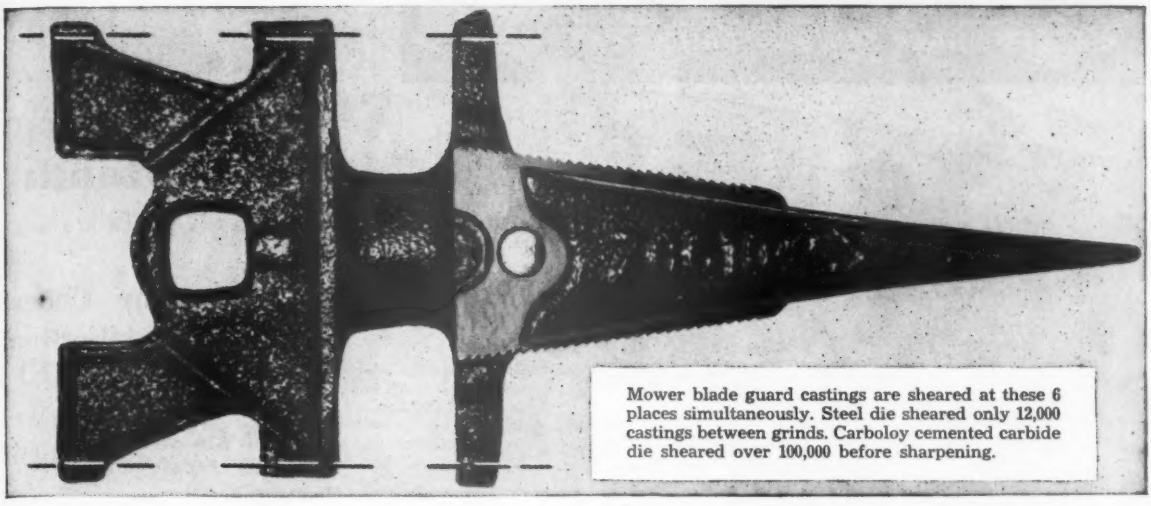

Mower blade guard castings are sheared at these 6 places simultaneously. Steel die sheared only 12,000 castings between grinds. Carboloy cemented carbide die sheared over 100,000 before sharpening.

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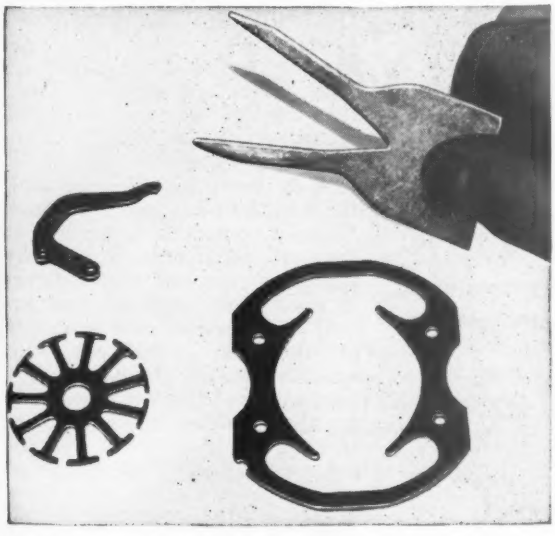

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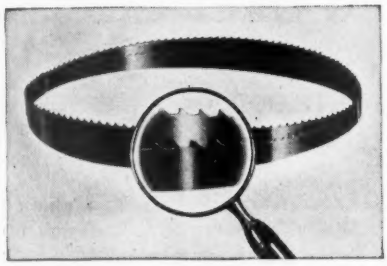

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Talks of the Month

The Philosophy Underlying the Specification MIL-Q-5923 (USAF)

by

Col. J. G. Schneider

Chief of Quality Control

Headquarters, Air Materiel Command
Wright-Patterson Air Force Base, Ohio.

I have been asked to discuss the philosophy underlying Specification MIL-Q-5923 (USAF), "General Quality Control Requirements" and to answer such questions as: "Why was this specification prepared?" "What does the Government expect to accomplish by it?" and "How can Industry best fit into the program defined 5923?"

First, the philosophy. There are several dictionary definitions of this word. The one that best fits our purpose today is the one that defines philosophy as: "A system of principles for guidance in practical affairs." Certainly, Quality Control can be classified as a practical affair, and there are well established principles upon which any effective Quality Control system must be based.

The AF system is predicted first on the principle that **quality must be built into a product.** When a contractor signs a contractual document he thereby agrees to complete said contract in accordance with all contractual requirements, and to supply all items in compliance with specified quality standards. Certainly, then, I think it reasonable for the Government, when contracting for material, to require the contractor to plan, organize, and control those elements in the manufacturing operation which

. . . *Continued on page 12*

These two talks, delivered by Col. Schneider and Lt. Col. Griffith at the 7th annual convention of the American Society of Quality Control, were designed to clarify the important aspects of the Air Force's inspection system. Our many readers having Air Force production contracts should find these discussions both interesting and helpful. E.W.P.

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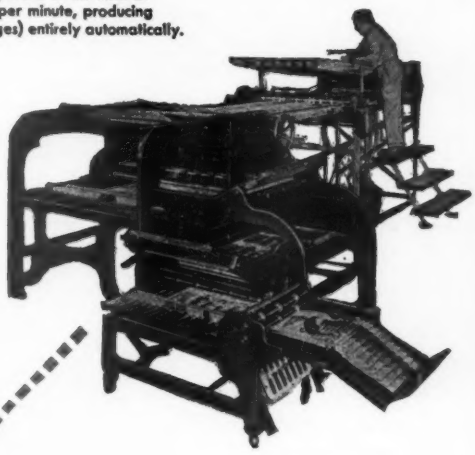
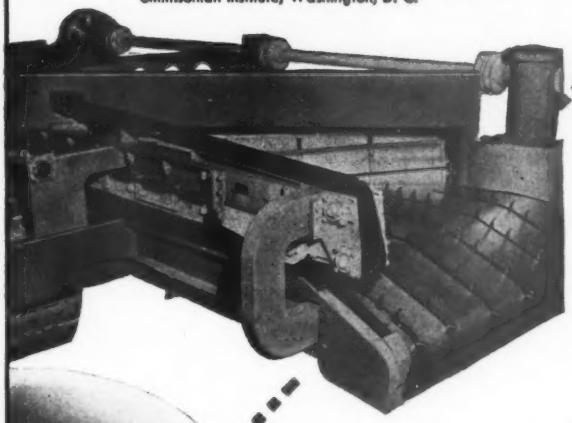


A RAMIE DECORTICATING MACHINE built by SEMCO, showing a "business end" view of the mobile unit that produces raw fibre from the fibrous RAMIE plant used for weaving into textile. Pictures of this machine in operation are considered of historical interest and are displayed in the Smithsonian Institute, Washington, D. C.



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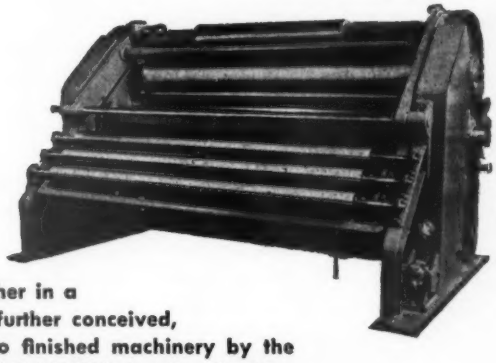

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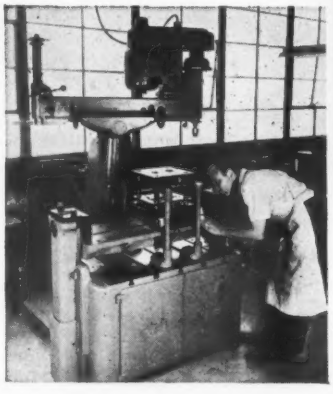
A battery of six Moore Jig Grinders performs precision internal and contour grinding operations on sectional die parts at the Harig plant.

Three rugged Moore Jig Borers handle the bulk of Harig's critical spotting, drilling, boring and reaming operations.

Harig uses this Moore Panto-Crush Wheel Dresser on a surface grinder for fast pantograph profile grinding. Harig also has two more of these cost-cutting units.



A Moore Die Flipper facilitates accurate die tryouts and assembly at Harig, replaces time-consuming hand-labor methods.

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. . . Q. C. Talks, from page 8

are necessary to assure that quality **is** built into the product.

The second principle underlying 5923 is that the **control of quality is the responsibility of the contractor.** The specification nowhere tells the contractor **how** to do the job. It merely defines contractually those elements which must be controlled if quality of product is to be assured. It consists of the general requirements for an acceptable quality control system. The procedures—the actual methods for complying with these requirements—are not stipulated. We recognize that there are many equally satisfactory ways of complying with the general requirements, depending on the product, the Industry, and the individual company.

The third principle upon which the specification is based is that there is a whole body of proven, well-established concepts and methods which are available to everyone for guidance in the practical business of quality control. As I have pointed out, this specification states that certain elements must be controlled. The "how" of modern Quality Control can be found in a host of periodicals and textbooks. The American Society for Quality Control, through the "Industrial Quality Control" magazine, training courses, lectures, and the activities of local chapters sponsored by the Society, does a superb job of telling how to control quality.

Now, the elements over which the contractor is required to maintain control, as defined in the specification, were not "dreamed up" by the Air Force. Rather, they were adapted from the procedures which the most quality conscious manufacturers felt were essential to the control of quality.

"Why was this specification prepared by the Air Force? Four basic objectives led to the preparation of 5923.

1. To place the responsibility for controlling quality on the contractor.

2. To provide Industry with uniform standards, in terms of general requirements for an acceptable quality control system.

3. To provide a contractual basis for the Air Force proced-

. . . Continued on page 17

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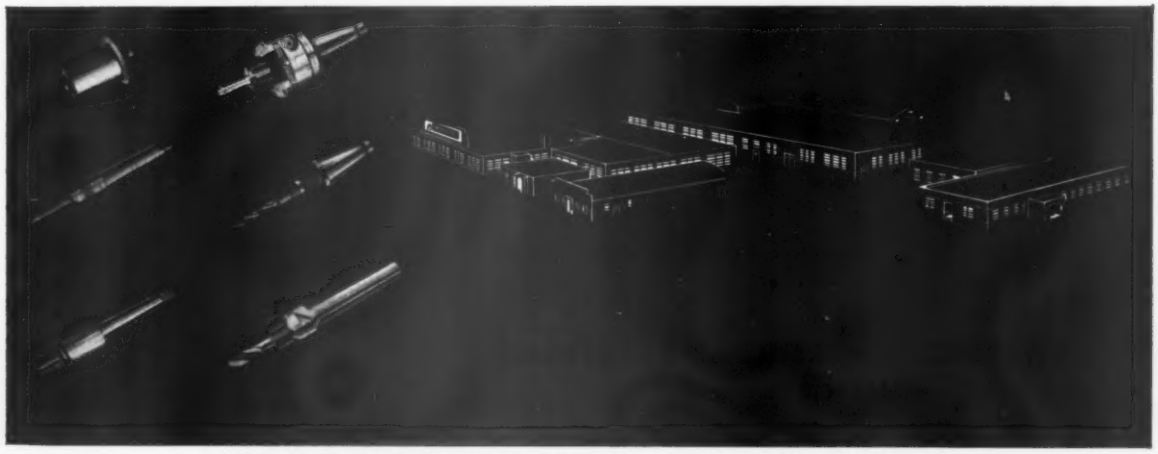

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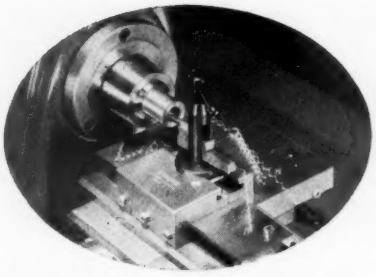
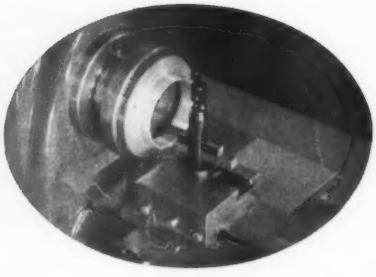
HIGH SPEED PRECISION LATHE

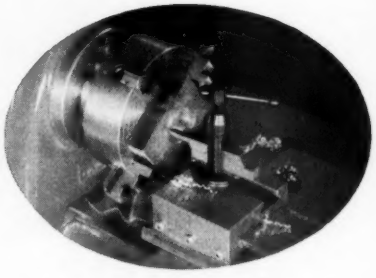
Correct Size - High Speed - Precision Results



Collet Work — The right machine for collet work of one-inch or less diameter.



Step Chuck Work — For rapid and accurate holding of tubing, castings, moldings, stampings and machined parts. Capacity to 6".



Jaw Chuck Work—Integral mount, universal or independent, for extra accuracy. Capacity to 5".

SPECIFICATIONS:
1" Collet Capacity
9" Swing
17" Center Distance
8 Speeds to 4000 rpm.

The above three important requirements for proper lathe work in tool rooms, production departments, or laboratories are completely fulfilled by the new Hardinge DV59 High Speed Precision Lathe.

Correct size of the machine in relation to work saves loss from under-capacity production on larger lathes. High spindle speeds, up to 4000 r.p.m., permit full capacity cutting and excellent finish. Sustained accuracy and ease of operation assure precision results.

Send for Free illustrated Bulletin DV 59

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE

FOR PRODUCT INFORMATION USE CONVENIENT INFORM-A-GRAM CARD

Levermatic
COLLET CHUCK

SPINDLE NOSE COLLET CHUCK

A New Standard For Positive Gripping. *Instant* internal and external gripping and releasing while machine is in constant operation, assuring continuous accuracy and uninterrupted production.

Faster... Lower Costs. Customers report big savings! One reveals his machine rates on production have been cut from 44½c to 22c per 100 pieces!

Used On Variety Of Machines. Lathes, Turret Lathes, Milling Machines, Grinders, Thread Grinders, Drill Presses, special production machines.

A PRODUCTION CHUCK FEATURING —

Highest Precision Accuracy
Full Spindle Capacity
Unequalled Gripping Power
No Heat or Friction
Full Bearing Collet
Simple Finger-Tip Adjustment
Economy and Labor Saving
Quicker Collet and Arbor Changes
Faster Chucking
Easy Mounting — Less Overhang

Expanding Arbor Broadens Use of Levermatic Chuck. Arbor is mounted in the chuck replacing the collet and collet nose for internal gripping. A complete range of expanding arbors is available for every job from 5/16" to 2½" dia. in the 1" capacity chuck, ¾" to 3⅝" dia. in the 1½" capacity chuck, and 1" to 4½" dia. in the 2" capacity chuck.

Fully Described in New Catalog
Shows Levermatic construction, specifications and many standard and special applications. Send For Copy Today!

ROTATES AS TRUE AS THE SPINDLE

Sutton Tool Company

DEPT. TP8, STURGIS, MICHIGAN

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

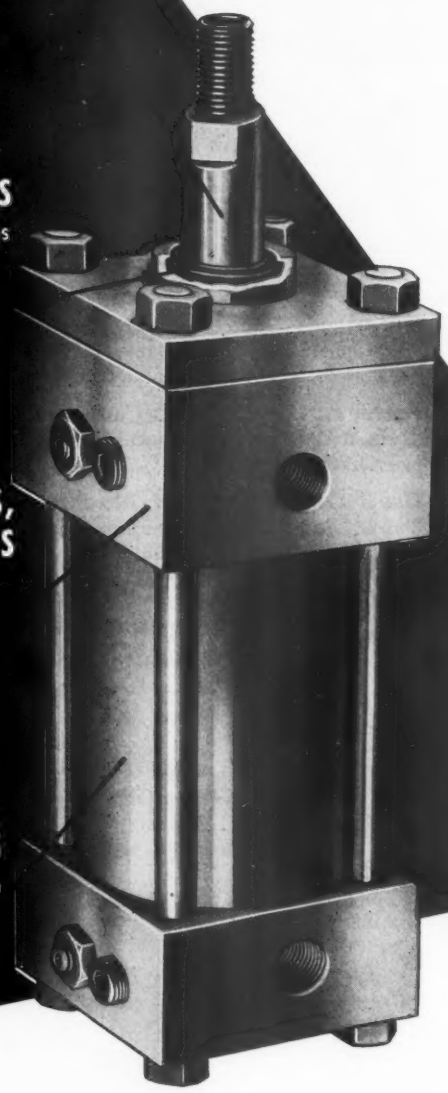
Miller AIR CYLINDERS

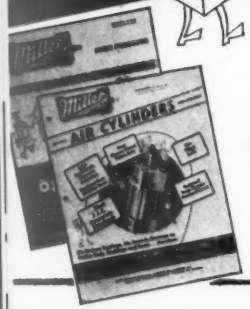
HARD CHROME PLATED PISTON RODS
Prevent Scratch-Damage, Nicks and Rust

DIRT WIPER SEALS
Protect Rods, Seals, Bushings

SOLID STEEL HEADS, CAPS and MOUNTINGS
Eliminate Breakage

BRASS BARRELS
Eliminate Rust and Corrosion





WRITE FOR CYLINDER BULLETINS A-105 and H-104

Complete Miller cylinder line includes: air cylinders, 1½" to 20" bores, 200 PSI operation; low pressure hydraulic cylinders, 1½" to 6" bores for 500 PSI operation, 8" to 14" bores for 250 PSI; high pressure hydraulic cylinders, 1½" to 12" bores, 2000-3000 PSI operation. All mounting styles available.

MET J. I. C. PNEUMAT STANDARDS years bef their adoption in 1950.

SPACE-SAVING SQUA DESIGN originated by Mi in 1945.

SALES AND SERVICE FROM COAST TO COAST

CLEVELAND • YOUNGSTOWN • DAYTON • PITTSBURGH • PHILADELPHIA • BOSTON • HARTFORD • NEW YORK CITY • BUFFALO • ST. PAUL • GRAND RAPIDS • DETROIT • FLINT • FORT WAYNE • SOUTH BEND • INDIANAPOLIS • MILWAUKEE • LOUISVILLE • KANSAS CITY • SEATTLE • LOS ANGELES • SAN FRANCISCO • BALTIMORE • DENVER • ST. LOUIS • MOLINE • CHICAGO • HOUSTON • TORONTO, CANADA and OTHER AREAS

Miller

MILLER MOTOR COMPA

2046 N. Hawthorne Ave., Melrose Park, Ill.

AIR & HYDRAULIC CYLINDERS • BOOSTERS • ACCUMU
COUNTERBALANCE CYLINDERS

. . . Q. C. Talks, from page 12

ures of "surveillance inspection".

4. To provide an incentive to contractors to explore and to make greater use of statistical methods of quality control. In this connection, I wish to emphasize that the Air Force uses the term "Quality Control" in the over-all sense. A common misconception is that it applies only to certain statistical devices. I want to point out that the specification does not make the use of Statistical Quality Control mandatory.

Let us now consider what the Air Force expects to accomplish by the use of 5923.

We believed that a clarification of the contractor's responsibility for controlling quality, as defined by 5923, would result in greater acceptance of these responsibilities. We believe it would be instrumental in getting top management to recognize the importance of the quality control function in the overall manufacturing picture. I am happy to say that we have not been disappointed. The contractors who are truly working to the specification are discharging their responsibilities and can prove with verifiable evidence that they are supplying quality products to the Government.

We fully expect that the quality of Air Force materiel will continue to improve, as contractors develop modern quality control systems. This is true not only because the manufacturers of the end item will be more adequately controlling quality, but because these manufacturers do and will require similar performance of their subcontractors and suppliers.

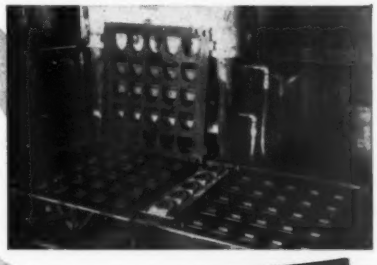
By means of 5923, the Air Force will obtain better assurance of quality with fewer personnel. In this connection it is significant to note that the Air Force now has a total of only 3800 Inspectors who are actually inspecting and accepting items for the Air Force. At the peak of World War II, before we had MIL-Q-5923 and surveillance inspection, there were approximately 14,000 inspectors. The workload at that time was comparable to that which we now have. As far as the **assurance** of quality is concerned under the new surveillance system, the Inspector now bases his decision of acceptability on veri-

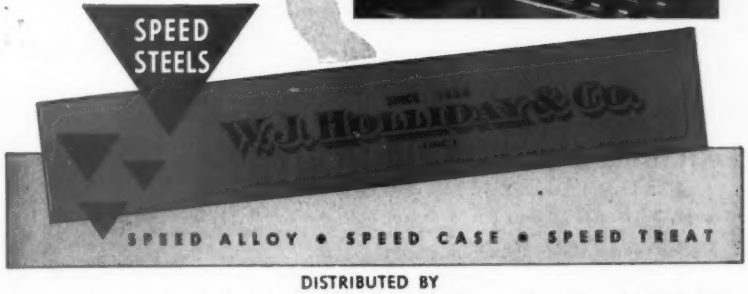
. . . *Continued on page 20*

SPEED CASE STEEL PLATE EASIER TO MACHINE

The Gro-Cord Rubber Co., Lima, Ohio, produces "puddle-proof" Neo-Crepe, Neo-Cork and Neo-Cord heels and soles of molded neoprene. They are widely used by manufacturers of footwear. Gro-Cord has speeded production and cut tool room costs by making their molds of Speed Case (X1515) low carbon, open hearth steel plate. Ease of machining has increased tool life nearly 200%— machining speeds and feeds have been increased up to 50%. Speed Case takes a "beautiful" finish — can be engraved more readily. Physical properties are such that no heat treatment is necessary in this instance — although many users praise the rapid, deep case which can be produced through several methods of case hardening.

The Speed Steels — Speed Case, Speed Treat and Speed Alloy can probably cut your costs or improve your product — get the facts!





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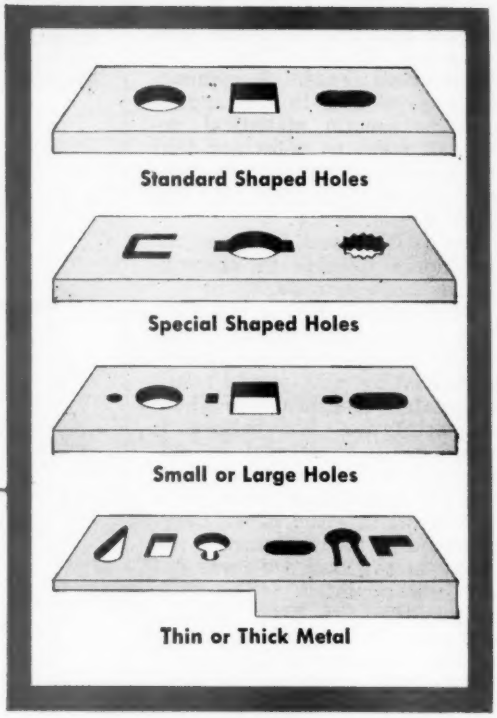
Brown-Wales Co., Cambridge-Hartford-Auburn, - Bridgeport Steel Co., Milford, Conn. Beals, McCarthy & Rogers, Buffalo, N. Y. - Burger Iron Co., Akron, Ohio - Grammer, Dempsey & Hudson, Inc., Newark, N. J. - Earle M. Jorgensen Co., Los Angeles-Houston-Oakland-Dallas - Passaic County Steel Service, Inc., Paterson, N. J. - Peckover's Ltd., Montreal-Toronto - Peninsular Steel Co., Detroit, Mich. - Pidgeon-Thomas Iron Co., Memphis, Tenn. - Horace T. Potts Co., Philadelphia-Baltimore-York, Pa.

Produced by W. J. Holliday & Co., Inc., Speed Steel Plate Division, Hammond, Indiana. Plants: Hammond and Indianapolis, Indiana

WHEN R-B Punches Are Used



What are your piercing or forming requirements—standard or unusual shapes—small or large holes—steel or special alloys—thin or thick metals? There is either an R-B punch in standard shapes and sizes or R-B will manufacture special punches, die buttons and retainers to your specifications that will provide more efficient piercing operations.

Many hole-making applications, formerly requiring drilling or some other costly means, can now be done with R-B interchangeable punches. If you have thought your piercing jobs too tough for interchangeable punches, it will pay you to investigate the wide application potential of R-B standardized equipment.

R-B Engineering Service Is Available for Your Tough Piercing Problems.

RICHARD BROTHERS PUNCH DIVISION
ALLIED PRODUCTS CORPORATION
Dept. 73 • 12635 Burt Rd. • Detroit 23, Michigan

Please send me additional information.

NAME_____ TITLE_____

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ADDRESS_____

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Also Produced in
OTHER ALLIED PLANTS
SPECIAL COLD FORGED PARTS
STANDARD CAP SCREWS
PRECISION GROUND PARTS
SHEET METAL DIES MADE OF FERROUS ALLOYS, ZINC ALLOYS OR PLASTICS

FOR PRODUCT INFORMATION USE CONVENIENT INFORM-A-GRAM CARD

Graph-Mo® steel die draws contour shell 5⅞" deep without scoring!

TO keep production up and finishing costs down when deep drawing contour shells for home fryers, the Dickey Grabler Company, Cleveland, Ohio, uses dies made of Graph-Mo®—one of four Timken® graphitic tool steels.

Because of the free graphite in its structure, Graph-Mo has outstanding low-friction properties: minimum tendency to score, seize, scuff or gall. As a result, Graph-Mo dies make the difficult 5⅞" deep contour draw without scoring the stamping. Costly polishing before the chrome-plating operation is eliminated, die life increased.

Graph-Mo offers other die advantages, too. The diamond-hard carbides in Graph-Mo give excellent resistance to wear and abrasion. It responds uniformly to heat-treatment, permitting closer tolerances in the parts. It has good stability, and is easier to machine than ordinary tool steels.

For more helpful information on the four Timken graphitic tool steels and their uses in dies, punches, gages and machine parts, write for the 10th edition of "Timken Graphitic Steel Data Book". The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

Here's
AUTOMATION
At Its Best

DPS Automatic HOPPERS, combined with DPS Engineering Skill provide outstanding time and labor-saving aid in this and hundreds of other unique assembly operations.

NOTE THIS TYPICAL EXAMPLE

Above is shown motorized hopper and transfer mechanism whereby eight (8) valve retainers are selected, oriented and transferred out to proper spacing and dropped over eight (8) valve stems simultaneously, and BELIEVE IT OR NOT, ALL THIS IN ONLY FOUR SECONDS! . . . This unit is used as a part of a special machine developed for the semi-automatic assembly of valves in V-8 MOTORS . . . just one of innumerable applications where DPS Motorized Hoppers, Power Screwdrivers and other Assembly Aids are conserving valuable production time in thousands of plants.

GET THE FACTS—*WRITE TODAY*
LESS WASTE TIME, LESS LABOR, LESS COST!

DETROIT POWER SCREWDRIVER CO.

2827 W. FORT ST. DETROIT 16, MICH.

. . . Q. C. Talks, from page 17

fiable evidence, rather than on end item inspection alone which was the practice during World War II.

By means of 5923 we have virtually eliminated Air Force duplication of the contractor's inspection. True, the Air Force Inspector does do actual product inspection. However, this inspection is performed primarily to verify the evidence of quality submitted by the contractor. Thus, the coordination of the two Quality Control organizations—that of the contractor and that of the Air Force—results in a pool of verified information, independently collected, available for the use of all echelons of factory management, as well as by the Government. In the absence of sufficient contractor-furnished evidence of quality, the Government Inspector must, of course, do product inspection, actually to determine the acceptability of the product. It does become necessary from time to time to place additional Inspectors in contractor's facility when more product inspection by the Government is necessary.

Finally, the "B" version of 5923 clarifies the hitherto nebulous quality control requirements for certain equipment in a developmental stage prior to production. The requirements are applicable only when Air Force Inspectors are contractually required to inspect or to accept the equipment at the contractor's plant.

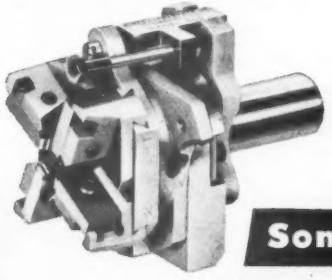
I am particularly happy to have been asked to answer the question, "How can Industry best fit into the program? This question indicates acceptance by your group of the specification and an eagerness to cooperate.

We should like to see every contractor take a positive, cooperative attitude toward 5923 and recognize the specification for what it is—the basis for a sound, modern Quality Control system, patterned after the best industrial practices. Contractor's representatives have stated to me that 5923 has enabled them to organize a really effective Quality Control system. Prior to their contact with this specification, many had never thought too much about the over-all problem as to the con-

. . . *Continued on page 29*

JONES & LAMSON GUARANTEES CLASS III THREADS with REPETITIVE ACCURACY!

J & L Automatic Opening Die Heads are sold with this guarantee: that your threads will be held consistently within the exacting Class III tolerances for form, lead and pitch diameter, throughout the long life of the J & L chasers.



FOR BROWN & SHARPE AUTOMATICS and SMALL TURRET LATHES
Capacities from #0 to 1¼"

RADIAL CHASER TYPE
Capacities from #8 to 4¼"

TANGENT CHASER TYPES
Stationary and Revolving. Capacities from #4 to 2"

Some of the reasons why:

COMPACT, RUGGED DESIGN GIVES MAXIMUM SUPPORT TO THE CHASERS. J & L Dies are made of solid steel, no built-up sections, hardened and precision ground throughout. Chasers are supported at the point of, and in the direction of, maximum strain.

THREAD FORM, HELIX, PRECISION POINT HEIGHT, ARE ALL GROUND INTO CHASERS AFTER HARDENING. This gives you a freer cutting tool, operating with minimum wear and repetitive Class III accuracy. The high precision of the J & L chasers is maintained in the Die by exclusive chaser holding features.

EASY, CONTROLLED RESHARPENING. J & L chasers are resharpened independently of the holders or dies. Instructions are simple, easy to follow. Eliminates guesswork. Exclusive holding features assure accurate resetting.

Only J & L Die Heads and Chasers give you ALL these features. Write to Dept. 710 for illustrated catalogs and complete information.

JONES & LAMSON

Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE CO., 519 Clinton St., Dept. 710, Springfield, Vt., U.S.A. J&L **DIE HEAD DIVISION**

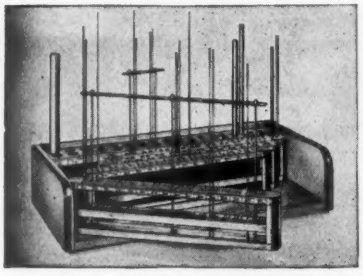
SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

inexpensive

. . . Money Saving Accessories For Your Plant

Each of the accessories illustrated and described below was designed and built for a definite need and used in our own plant before being offered to industry. They require a relatively small investment, yet will save you money every day. For further information, write for the folder offered below.

DRILL ROD RACK

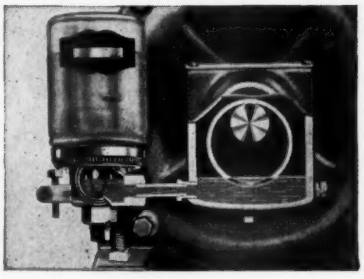


Eliminate trouble and waste effort with this modern method of storing drill rod. Put the Acro rack in a central location of each department and make it simple for each mechanic to select correct rod size in a hurry. It also provides a visual inventory for checking rod replacements.
Accommodates 26 letter sizes, 52 pieces; 47 fractional sizes, 138 pieces; 60 number sizes, 304 pieces. Fractional sizes graduated in 64ths from 1/32" to ½" and in 32nds from ½" to 1" included.

LEADER PIN OILERS

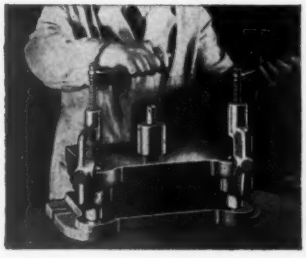
Eliminate wear on your die sets with these leader pin oilers. Acro Pin Oilers, as illustrated, fit over each leader pin and seals in place with a rubber neoprene washer. Each cup is filled with oil so each downward stroke brings bushing in contact with oil and each upward stroke distributes oil evenly over leader pins. Eliminate bushing wear, leader pin scoring, and maintains die accuracy. Die sets equipped with Acro Pin Oilers have run under tests for several weeks to a month without refilling.

AUTOMATIC LUBRICATORS



With this Acro lubricator, you can lubricate oil ring, capillary, ball or roller bearings on electric motors, blowers, lineshafts and similar bearings for periods as long as six months to one year with one filling. You can save 50 to 95 per cent in oil consumption, practically eliminate maintenance labor and burned out bearings due to faulty hand oiling and guesswork. In addition to savings effected in labor and maintenance, Acro lubricators soon pay for themselves in oil savings alone.

DIE SET PULLERS



The principle of the Acro Die Set Puller is to remove the punch holder from the die shoe by a straight upward pull, whereby punch holder travels upward from die shoe axially, leaving both leader pins simultaneously. This is accomplished only by use of the indexed screw wrenches which act as indicators, controlling the upward travel. This is an exclusive patented Acro feature, found only in Acro Die Set Pullers.

Free Data

covering each of these profitable accessories is included in our folder. Write for bulletin TP-52.

ACRO

METAL STAMPING CO.

330 EAST RESERVOIR AVE.

MILWAUKEE 12, WIS.

FOR PRODUCT INFORMATION USE CONVENIENT INFORM-A-GRAM CARD

Maintenance report from user of 13 Rotor Grinders:

"after 14 months COST $0.00"

THIS large manufacturer of electrical equipment has been using 13 Rotor B-35 Vertical Air Grinders for 14 months—two shifts per day, 6 days per week—for sanding, wire brushing and grinding. They report that not one cent has been spent for maintenance—no time out for repairs! And metal removal has been far greater than with other types of grinders . . . and their good balance make them popular with operators.

If you haven't seen these new Rotor Vertical Grinders in action, ask for demonstration today!

AIR O'TOOL

ROTOR VERTICAL SPECIFICATIONS

	B-35	B-12
Weight	10¾ lbs.	10 lbs.
Wheel Size	6" Cup	6" Cup
Pad Size	7" or 9"	7" or 9"
Speeds	6000, 5000, 4500, 3500	6000, 5000, 4500, 3500
Height	7½"	7"

For cup wheels, sanding pads, cut off wheels, wire brushing.

WRITE TODAY FOR BULLETIN No. 40

AIR HIGH CYCLE

THE ROTOR TOOL CO.

CLEVELAND, OHIO

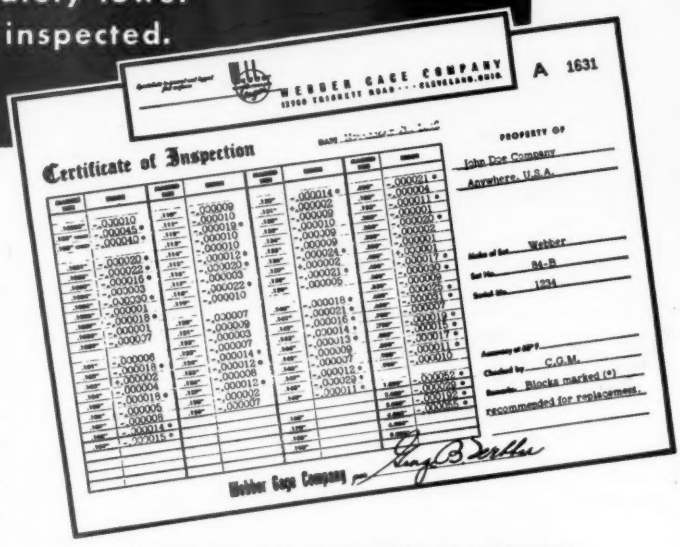
UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

Don't invite controversy!

Have your gage blocks inspected periodically

$16.50 for an 84-block set.
Smaller sets proportionately lower
. . . all makes of blocks inspected.



Don't allow wear in gage blocks to cause unexplained difficulties in assembly. When trouble develops start checking the blocks immediately.

If they have been used daily for any long period of time they should be examined just to make sure their accuracy is still within tolerated limits. Better yet send them to us before trouble occurs. You may find that only a few blocks need replacement.

Instead of discarding an entire set, replace those that need replacement and save money in doing so. The set will be returned within 24 hours after it is received with a certificate of inspection, noting the degree of wear of each block. Webber Gage Company, 12903 Triskett Rd., Cleveland 11, Ohio.

INSPECTION SERVICE INCLUDES:

1. Comparison with master blocks certified by the U. S. Bureau of Standards.
2. Removal of burrs and nicks which impair accuracy.
3. Notation of degree of wear of each block.
4. Identification of those blocks that are worn or damaged beyond repair with recommendation for replacement.

WEBBER GAGE COMPANY
12903 Triskett Rd., Cleveland 11, OHIO

Webber

MICRO-ACCURATE GAGE BLOCKS & FIXTURES

LARGEST EXCLUSIVE MANUFACTURERS OF GAGE BLOCKS

FOR PRODUCT INFORMATION USE CONVENIENT INFORM-A-GRAM CARD

18 Delta drill presses work interchangeably on several materials. Additional machines, set up ready for use, can be moved in and out of the line. Simple fixtures and Delta accuracy make jobs practically fool proof on machines that almost "run themselves."

Down Go Costs

WHEN ASTATIC CORP. PUTS **DELTA TOOLS** ON JOB

These Production Ideas Will Work for You, Too!

Here's how the Astatic Corp., Conneaut, O., manufacturer of microphones, radio, phonograph and television parts, gets high production and high precision at low cost with a shop full of Delta tools—drill presses, grinders, metal cutting bandsaws, and abrasive finishing machines.

FLEXIBILITY—

Because Delta tools are light and mobile, Astatic takes them to the material, cutting handling costs; moves them, already set up, in and out of the production line as jobs change. Five different materials from steel to plastics are machined on the same Delta tools.

INTERCHANGEABILITY—

By standardizing on Delta, Astatic uses the same jigs and fixtures on several machines without adjusters.

FEWER SET-UPS—

By keeping machines set up for special jobs, one operator can tend several machines and do sequence operations. No waste motion. Because Delta tools are a low capital investment, they don't have to run constantly to pay out.

QUALITY—

Most of the Delta tools at Astatic have been on the job six to nine years with only routine maintenance—proving that Delta gives you machine tool quality at a cost any production operation in your plant will justify.

Do you have an up-to-date catalog of Delta tools? Call your Delta dealer. He's listed in your Classified Phone Book under "Tools", or write for Catalog AB, Delta Power Tool Division, Rockwell Manufacturing Company, 622H N. Lexington Ave., Pittsburgh 8, Pa.

DELTA QUALITY POWER TOOLS

Another Product by **Rockwell**

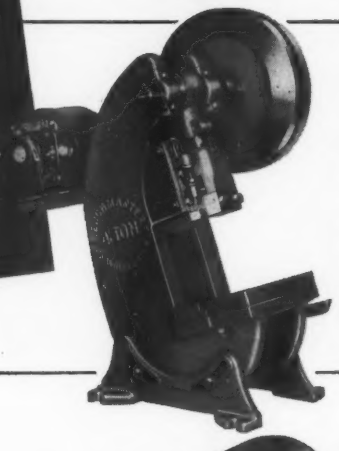
SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

benchmasters are now available in 51 models!

THERE'S A STROKE LENGTH AND TONNAGE FOR YOUR JOB!

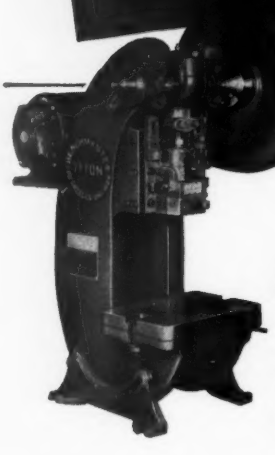
1-ton Midget

A small, high-speed press that packs a 2,000-pound punch in its midget size! Ideal for work now being done manually or with kick presses. It reduces operator fatigue, increases production many times and produces more uniform parts.



4-ton Standard

The unquestioned leader in the small punch press field for over a decade. No other small press can match its performance, ease of operation, reliability and economy of operation. 285 strokes per minute, wide stroke range. *Also available as a half-press!*

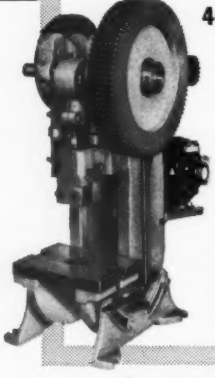


7½-ton Standard

A massive, heavy-duty press with 7¾" of die space! Built with the extra tonnage capacity to easily handle jobs overloading smaller presses. Moderately priced. *Also available as a half-press!*

4-ton Deep Throat

Punches to the center of a 17½" circle! Extra deep throat accommodates large, bulky sheets as well as conventional work. Massive frame is heavily reinforced. Uses standard 4-Ton press parts for quick replacement. *Also available as a half-press!*



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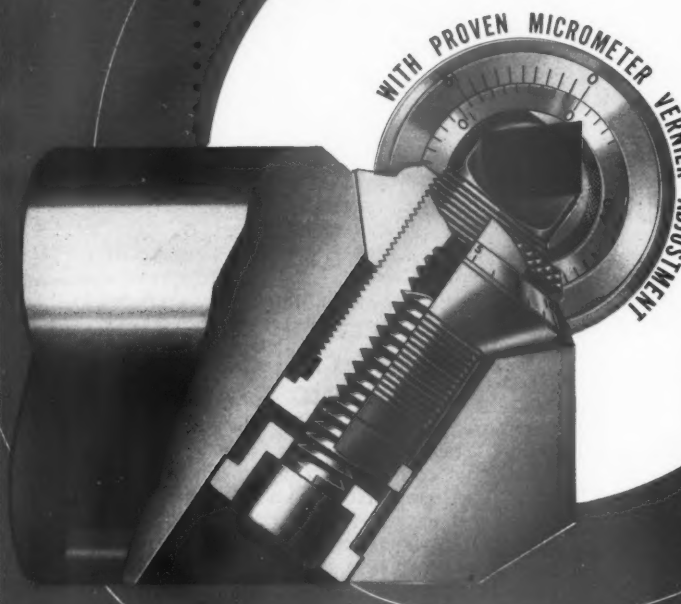

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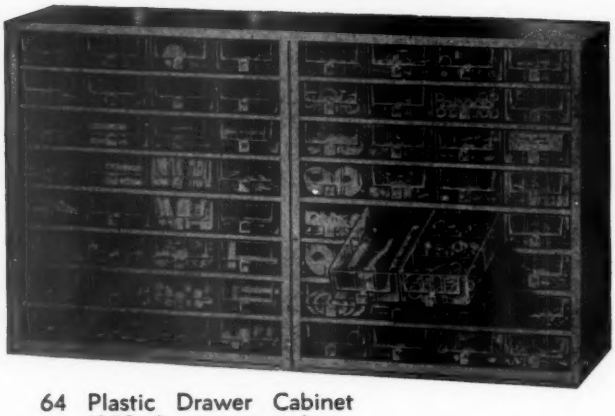

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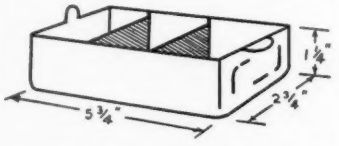

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. . . Q. C. Talks, from page 20

trol of quality. They had not considered all the elements which have an effect on quality. Contractor's representatives have also stated that, by means of 5923, they have convinced top management that certain functions beyond the scope of inspection, in the more limited sense, needed to be controlled.

Naturally, we find occasional contractors who are opposed to 5923B; primarily, I suppose, because it is something new to them because of the very nature of man's reluctance to accept change. By and large, however, I have noted that the people who argue about the specification haven't open-mindedly studied it thoroughly. They feel that it imposes new requirements upon them. Of course, it does impose new requirements on a contractor who is not doing much to control the quality of his product. On the other hand, practically any producer who actually controls quality by sound systematical procedures and resulting evidence of quality is in compliance with 5923.

We ask contractors to be objective in their evaluation of 5923. All too often contractors are worried about possible misinterpretations which a local Air Force Inspector might make in connection with the specification. However, the possibility of misinterpretation is no reason for discarding a document which has proved thoroughly workable and beneficial over a period of two and one half years. Practically any other requirement of the contract might also, at some time or other, be misinterpreted by Government personnel; and, for that matter, the Government runs the risk of the contractor's misinterpretation of terms of the contract. We have just revised our instructions to the Inspector to minimize misinterpretation.

We ask you to be tolerant of Air Force Inspectors. To many of them, 5923 is a relatively new tool, and it takes them time to learn to use a new tool, just as it does contractor's personnel. Help develop the cooperation with the Air Force Inspector that is so essential to the proper working of 5923. Remember that the Government Inspector has a big responsibility. When he accepts a piece of equipment

. . . Continued on page 70

WHICH POWER TYPE IS BEST FOR YOU?

. . . electric, gas, diesel or L.P. gas?

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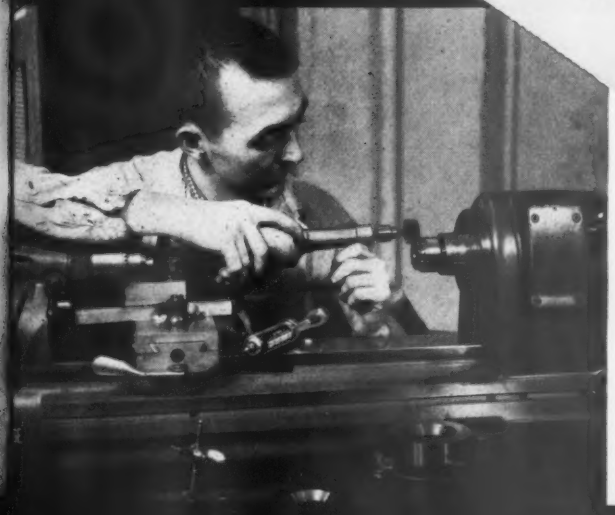

This ALLIED operator is using a rotary felt bob and ELGIN DYMO C to polish carbide sizing pins. Again, Elgin Diamond meets ALLIED'S requirements for consistent accuracy and flawless finishes—every time!

Here's How WYMAN-GORDON trims jet engine turbine wheels with a 600 ton

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Illustrated above is the 600 ton Verson single crank, single action, double gear twin drive press. Bolster area, F.B. x R.L., is 56" x 48". At left the piece being removed from the press after trimming.

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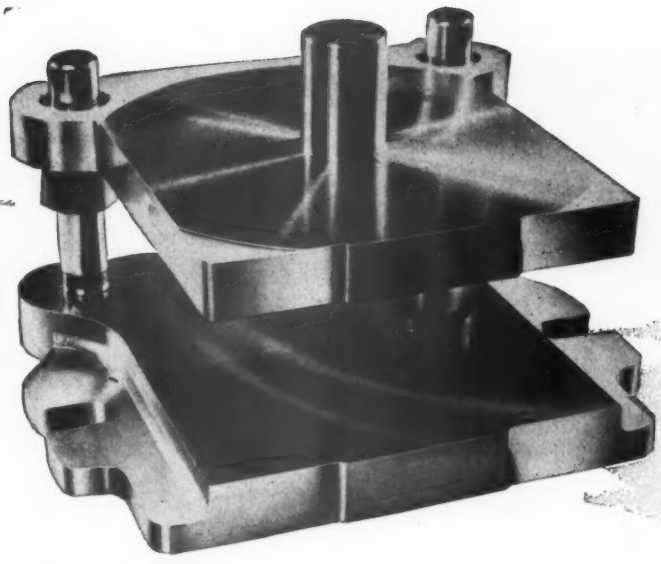

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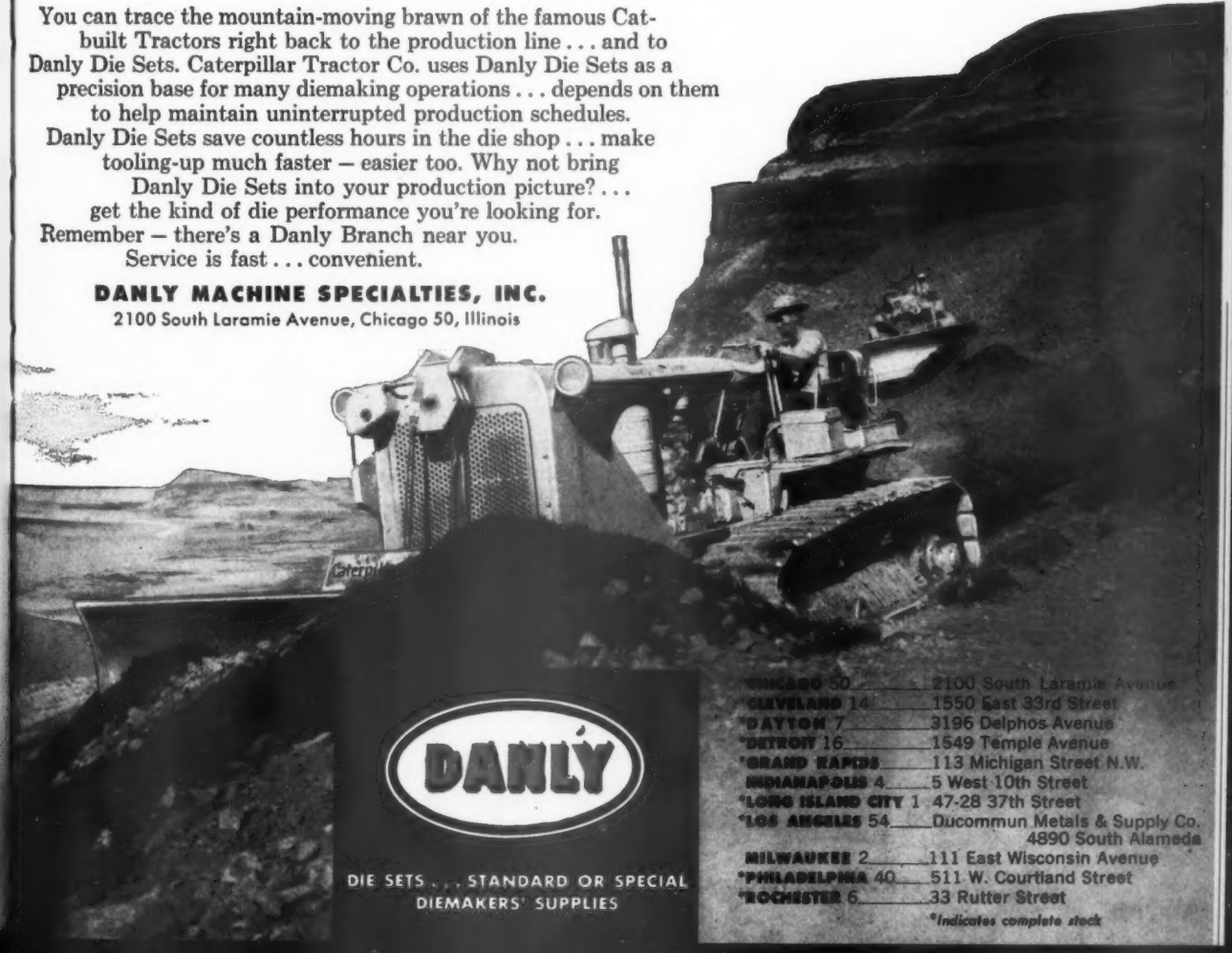

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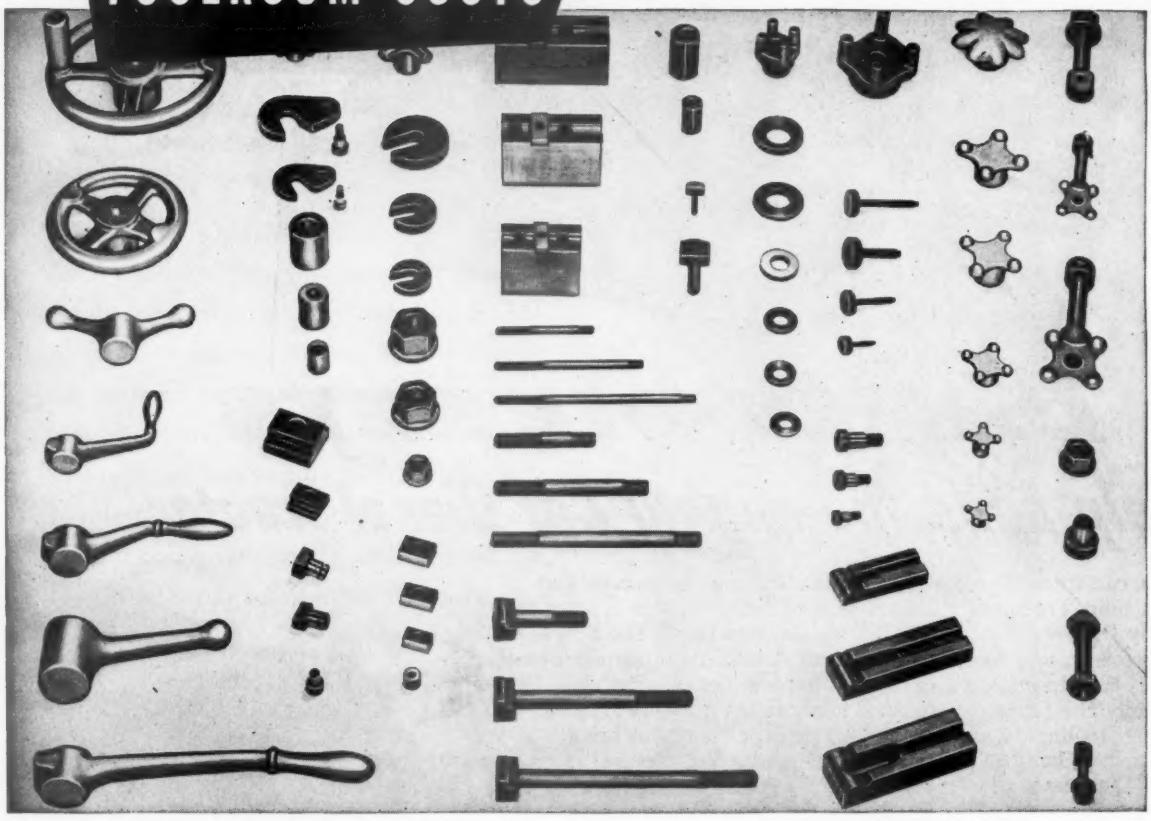

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quality control

Next October will see our 6th Annual QUALITY CONTROL Feature Issue. These have become very much an institution with us and our readers.

Over the years we have enjoyed being "in the middle" relative to Quality Control, but not in the sense that there has been any controversy which we have avoided. Rather, our position has been that of the middle man in the distribution of Quality Control know-how and show-how.

Our pages have served to convey the principles and practices of Quality Control from those who were pioneers and well versed in the field to those who needed the knowledge in order to improve their production operations.

The progress that has been made in refining, simplifying and furthering the techniques of Quality Control has been great, and can be best appreciated by a brief flash-back.

In October 1947 this page, as today, was entitled, "quality control". Included in the editorial were a few quotations from spokesmen for some of our largest metalworking plants Their remarks showed how, at that time, the essentiality of Quality Control was gaining a foothold.

They said, ". . . we are in the midst of our primary experiments with this system . . .", ". . . the methods are so new to us that our plans are changing almost daily", "We have had a fair amount of experience in applying Quality Control techniques to . . . manufacture . . .", ". . . we here, at the . . . are still in the embryonic stage . . .", "Here at . . . we are in the process of formulating our plans for a Quality Control program", "The main interest of our division in this type of control is from the standpoint of acceptance inspection of raw materials", ". . . and have, at the present time, a fairly good example of Quality Control being used in the manufacture of production tools . . .".

Today, in contrast to the foregoing, we find in those pioneering plants that Quality Control has become just as much of a manufacturing function as the toolroom, the screw machine department or the conveyor lines. Quality Control is looked upon as a manufacturing management tool, it reports direct to management, and it enjoys an increasing share of the operating budget.

So we find that in today's manufacturing operations there are more of the tools of Quality Control in the hands of production workers than ever before.

Although the **statistics** of Quality Control record performance, indicate inspection methods and equipment, and give warning of threatened deviation from specifications, the **tools** of Quality Control are what govern accomplishment.

That is why, today, we see more measuring tools in the hands of workers, more comparators, air and electronic gages right alongside high production machines, more air-conditioned and temperature-controlled standards rooms for policing a plant's working gages, and more subdivisions of the inspection operations, than ever before.

That is why, too, that the newest, most productive, and most economical machine tools, special machines and tooling are being built with the quality capability of turning out work-pieces to closer and closer tolerances.

Our extensive treatment of all of these vital phases of Quality Control is why our annual Q-C Feature Issues have come to enjoy such enthusiastic and widespread acceptance. For us, there has been no lack of incentive and inspiration in the production of them. Your expressions of interest are ample reason for our doing the job.

Our 6th Q-C Annual in October is destined to be the biggest and best yet. This is due to our insistence that Quality Control, in spite of its progress to date, is still facing up to its greatest challenge.

Admittedly, Quality Control has worked wonders in reducing scrap and waste, in eliminating rejects, and in increasing productivity. Now, with undeniable signs that in many lines there is a shift from a sellers' market to a buyers' market, the customer is riding high in the saddle; he represents the highest and last court of appeal for product acceptance.

Nothing but Quality Control, with its insurance of high grade material, of skilled workmanship, and of satisfactory and lasting performance can do so much to attract prospects and win customers.

E. Willard Pennington

editor

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Capsule description of current literature. Bulletins, brochures, catalogs and circulars - - - You name it!

QUICK PIC CATALOGS 119
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Reach up on the rack - - - take your pic.

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QUALITY CONTROL "The Philosophy Underlying the Specification MIL-Q-5923 (USAF)" by Col. J. G. Schneider, Wright-Patterson Air Force Base 8
In Col. Schneider's talk before the American Society of Quality Control he discussed the principles which guide the Air Force in the procurement of materials. First, that quality must be built into a product. Second, that the control of quality is the responsibility of the contractor. Specifications state the elements which must be controlled and the contractor must find a method of controlling the elements.

DIES "Strippers and Stock Guides for Progressive and Automatic Progressive Dies" by Ernest J. Urbas, The Guarantee Specialty Manufacturing Co. 39
In the second part of this article Mr. Urbas discusses five types of movable strippers and stock guides. The action of each of these is given in detail and the application in which they are advantageously used.

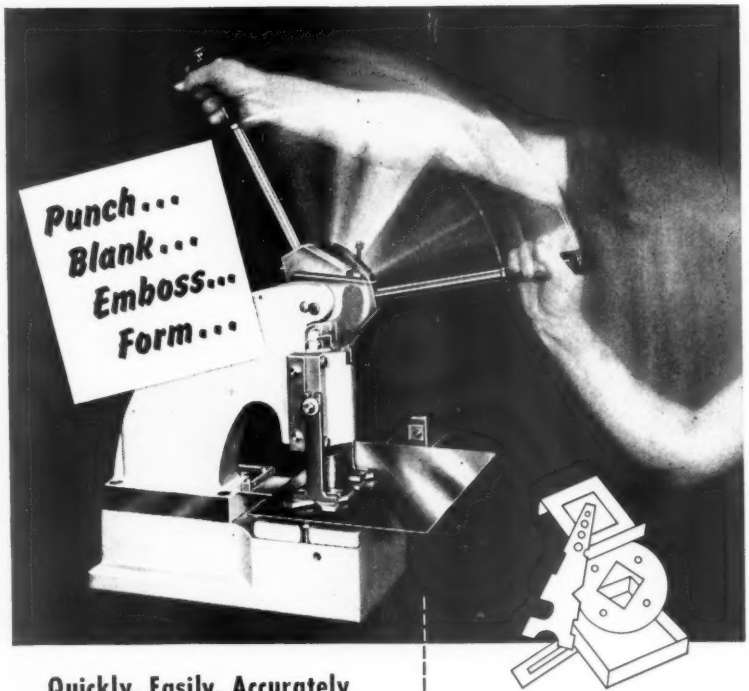
EXTRUDED PARTS "Complex Shapes Formed from Bar Stock Without Machining" 42
Koldflo, an extrusion process, was developed to cold shape steel by displacing metal under compression. Parts are shaped from cold bar stock which formerly required machining.

AUTOMATION "Safe Application of Electrical Control on Machine Tools", Ford Motor Company 44
An analysis of the electrical controls necessary on machine tools to insure safety to the operator and machine.

BUCKETS AND BLADES "Jet Engine Tooling" by C. L. Sadon, General Electric Co. 48
The most important parts of the jet gas turbine are the buckets and blades. Mr. Sadon gives the tooling procedures for machining these parts.

CARBIDES "Carbides in the Pressroom" (continued) by Lester F. Spencer, Landers Fray & Clark 53
In this second installment, Mr. Spencer discusses the design of dies in which carbide inserts can be used to advantage.

CHIP DISPOSAL "Chip Disposal Unit Pays for Itself Within a Year" .. 58
A chip disposal system is described which recovers 20% more cutting oil, returns $4.00 more per ton for the scrap, and has reduced scrap loading time from six man-days to 60 man-minutes.



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QUALITY CONTROL "Practical Implications of the Air Force Quality Assurance Program" by Lt. Col. O. C. Griffith, Wright-Patterson Air Force Base.....70

In Lt. Col. Griffith's talk he points out how Quality Control benefits industry contractors supplying Air Force materials. Before Quality Control methods were a part of an A. F. contract, many manufacturers found themselves totally incapable of building military equipment to unfamiliar requirements during periods of national emergency.

BASIC MATERIALS "Developing Cooperation in Selecting Materials", by Theodore A. Jagen, Hyatt Bearing Div., General Motors Corp...81

In treating this subject Mr. Jagen shows that cooperation in the selection of materials can be achieved through proper organization with strong management support. The design of a roller bearing, its manufacture, and its end use calls for the cooperation of a group of specialists to correctly choose the right steel.

ABRASIVE DRUM COVERS. "How to cut Spiral-Wound Abrasive Drum Covers" by William T. Conway, Behr-Manning Corp. 104

Specific instructions, together with formulas, are given for cutting abrasive drum covers. Improper cutting of the cover often leads to waste and malfunction of the machine.

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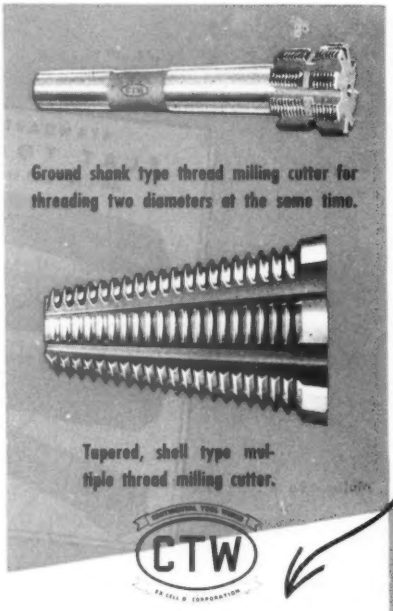
Check this carefully. It can bring new efficiency to your operation. The newest in machines, tools, and accessories.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STRIPPERS AND STOCK GUIDES For Progressive and Automatic Progressive Dies

Many details of stationary or fixed types of strippers were shown by Mr. Urbas in the March 1953 issue. His articles on the building of separate die elements will be followed by construction details of complete automatic dies.

by Ernest J. Urbas
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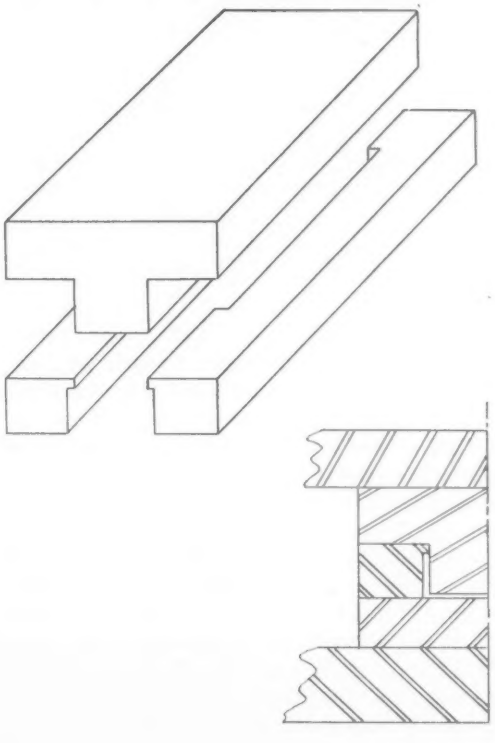
MANUFACTURING COMPANY
Cleveland, Ohio

Movable Type With Center Step for Formed Parts

This type of stripper is successfully used in a cut and carry die. The feature of this style is that light gage metals are actually formed by the stripper. This unorthodox practice is known by a small number of builders and designers of cut and carry dies. This stripper is usually double the thickness of the ordinary step type stripper used in flat blanking, because of the extremely high parallel guides and the strength necessary for the bottoming or hitting home that "sets" the forms or bends.



The high guides are used because the forming stations are above the die block. The forms are made by the pressure applied on the stripper as the press ram comes down. It (the stripper) presses against the material which is resting on top of the form stations. Continuing downward, and acting just as a form punch would, it bends the material in the form dies, and just before hitting bottom the blanking takes place.

As the press ram ascends the material is raised from the form stations by the pads. Continuing upward the material is stripped from the stripper by the overhanging edges of the stock guides and spring ejectors built in the stripper at the forming station of the stripper.

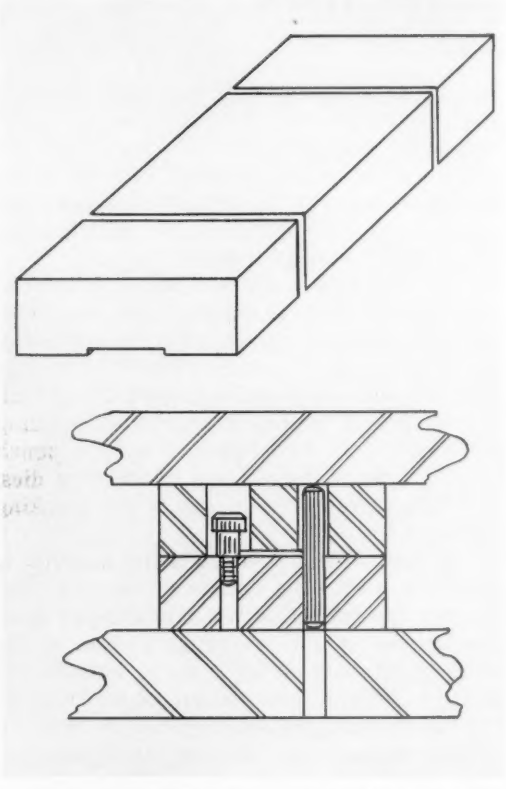
The overhanging stock guides are most essential on automatic dies for the protection they offer in preventing the strip from escaping between the guides and for stripping the material from pilots which always extend beyond the stripper.

Movable Type: Flat Plate Pressure Pad and Stripper

The primary use of the flat plate pressure pad style of stripper is on automatic dies where pressure is used for drawing purposes. This movable type of stripper is used with great success on automatic dieing machines such as the Henry and Wright, or Brandes, because of the simple means that are employed to build up pressure in order to draw difficult jobs.

Trying to build up pressure by loading a

die with enough springs to run a difficult draw job, in a conventional type of press, is usually impossible to accomplish. The trick in successful drawing with this stripper is in grinding a channel in the pressing face of the stripper. This channel should be about five thousandths less than the material thickness and one quarter of an inch wider than the stock width. When this stripper is in operation it cannot tip enough to throw any punches out of line, either in the starting or the finishing of the strip.

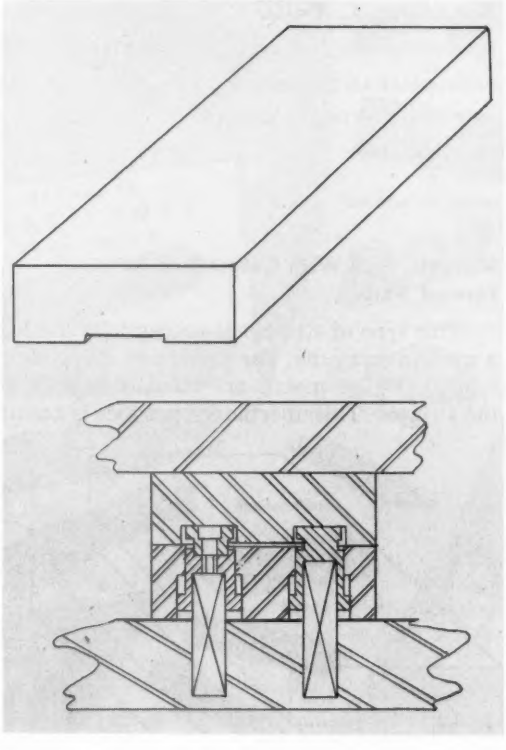


It is desirable in automatic dieing machine operation to have the stripper in one piece but sometimes conditions of drawing or redrawing compel the stripper to be cut or divided in a number of sections.

The stock guides used with this stripper are usually dowel pins spaced to the stock width at the first or second station of the die only. The reason for this is that as any forming or cupping job is done beyond the first or second station, the strip is narrowed in width and the drawn shape serves to do the piloting. Sometimes shoulder screws are used instead of dowels. The heads of the shoulder screws prevent the stock from being carried up with the stripper by adhesion.

Movable Type With Flat Plate for Formed Parts

This type of stripper for formed cut and carry parts differs from the step type in that this stripper is used when the parts are being formed downward into the die whereas in the step die stripper, the forms are formed upward into the stripper. The employment of this style stripper in forming dies, requires a unique stock guide. This stock guide in addition to guiding the stock also lifts the strip with its drawn shapes up high enough so that automatic progression can take place.

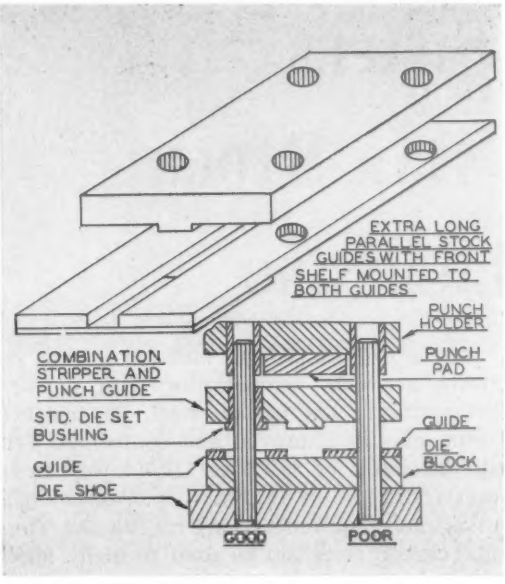


The stock guides are spring loaded thus assuring positive movement upward with the stripper. These lifters or stock guides are undercut at a safe distance from the top and are located in the die in accordance to the stock width. The stripper must be bored to clear the heads of the lifters so that the stripper can contact the strip.

The lifters that are positioned along one side of the strip should be made with replaceable tops. Thus in the event that material wider than the original is brought to the press these replaceable tops can be removed and ground to accommodate the increased width without removing the die from the press.

Movable Type: The Center Step, Guide Post Guided Stripper

The center step, movable, type of stripper found on the highest class of blanking dies usually combines guiding action for the stripper as well as guides for the small punches that are ordinarily called for by the type of blank these expensive dies produce, i.e., laminations, shims, razor blades, etc. which must be produced absolutely burr-free.



Making a multitude of stampings burr-free is a very difficult thing to accomplish yet it can be done by the exactness to which the stripper is made. This is accomplished by jig boring, hardening, then jig grinding the holes for the punch guides and the four guide bushing holes which match the jig bored die set. These holes are bushed for easy replacement in the event of damage or wear.

The step on the stripper performs an important function which is usually overlooked. The step on the stripper must be exactly equal to the thickness of the guides minus the material thickness. Thus when the stripper meets the top of the guides it also is in contact with the material, but not hard enough to mar the surface of the material.

If the guides should be thinner than the step on the stripper, then as the face of the stripper contacts only the length of material entered in the die for the first hit, the stripper would tend to tip. This is because the other end of the stripper, which is spring loaded, would be unsupported by the too-thin guides. Any tipping of the stripper would spring the punches out of line during the first hit and cause the edges of the punchs and the die openings to shear.

Sometimes balancing buttons are used to accomplish this leveling which must be insured at all times. Buttons reduce the areas where any foreign matter may collect, causing tipping of the stripper. If buttons are used, their faces must be large enough to prevent sinking into the stripper.

The guides shown here have a shelf assembled beneath the extension of both guides. This shelf assists the press operator in starting the strip, the long extensions assist in squaring the stock for the assurance of proper progression. The parallel guides even though hardened are subject to severe wear from the thin hard metal that this type of die usually cuts. To avoid this wearing condition, carbide inserts are brazed in spots intermitently in the parallel guide working faces.

If this stripper is pressure loaded with springs, care must be taken to be sure that the stripper is a safe distance away from the punch pad. If this distance was close, in the event that a spring broke it would lay between the punch pad and stripper and smash between the two, causing extensive damage to the die. Operating in a dieing machine this problem is avoided, for no springs in the die would be necessary. Pressure by a rubber cushion or air cylinder could be applied on the top of the press.

Movable Type With Center Step for Automatic Blanking

This stripper differs from its counterpart, the guide post guided stripper, in that the guidance of the stripper is not allied to the guide posts of the die set. This style is customarily used when the builder purchases ready-built diesets. The actual guiding of the stripper is achieved by inserting drill jig or bronze bushings in the stripper in two or more locations, mating with dowel pins in the die block.

Standard bushings and pins espressly for such a purpose can be purchased from stock. These standard stock items provide the maximum productivity that can be achieved by this type of guiding method.

It must be understood that the guiding

. . . Continued on page 145

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COMPLEX SHAPES FORMED FROM BAR STOCK WITHOUT MACHINING

THE KOLDFLO PROCESS, developed in the past several years by Mullins Manufacturing Corp., will soon be available for many new commercial applications. Although this has often been referred to as "a cold extrusion process", it actually goes beyond extrusion. Koldflo was developed to cold shape steel by displacing metal under compression. It can produce simple shapes . . . but also can produce from solid bar stock many parts that formerly required considerable machining.

This process successfully combines numerous operations including forward and backward displacement, ironing, compressing, coining, and expanding. Consequently, Koldflo is not limited to simple shapes, such as straight-walled cylinders, but will produce such forms as integral studs, offsets of any type and combination, multiple flanges, lands or flutes, integral web or separators, and others. Square corners, round corners, fillets of all shapes, either inside or outside, can be produced.

Parts illustrating the range of possible shapes are shown here. All were produced in dies. Pieces are complete as they come from the presses, the only machining required being simple threading where called for by part design. Threading is easily done with high speed steel cutting tools.

In the Koldflo process, metal is worked entirely at room temperature with physical properties in low carbon steel, for instance, being greatly improved and controlled. Tensile strengths of 85,000 to 110,000 psi can be created in 1010 or 1012 steel; yet, commercial elongation requirements are maintained. Thus, low carbon steel can be used in many applications to meet specifications that formerly demanded more costly alloy steels.

A high hardness can be attained that is uniform throughout the piece and not merely on the surface. Where the greater hardness is undesirable, original hardness can be returned by annealing. Extra hard surfaces are obtained by carburizing, but distortion due to carburizing is far less than in parts formed by other processes. Tolerances and surface finishes are usually acceptable without further machining. Glass-like inside and outside surfaces, as smooth as 50 micro-inches, can be obtained when desirable.

Since the steel is worked under compression, superior grain structure results. In pressure vessels, or elsewhere, a sound leakproof base can be created by means of an interlocked grain flow.

When the Koldflo process was first applied in production, it was largely restricted to the production of artillery shells for national de-

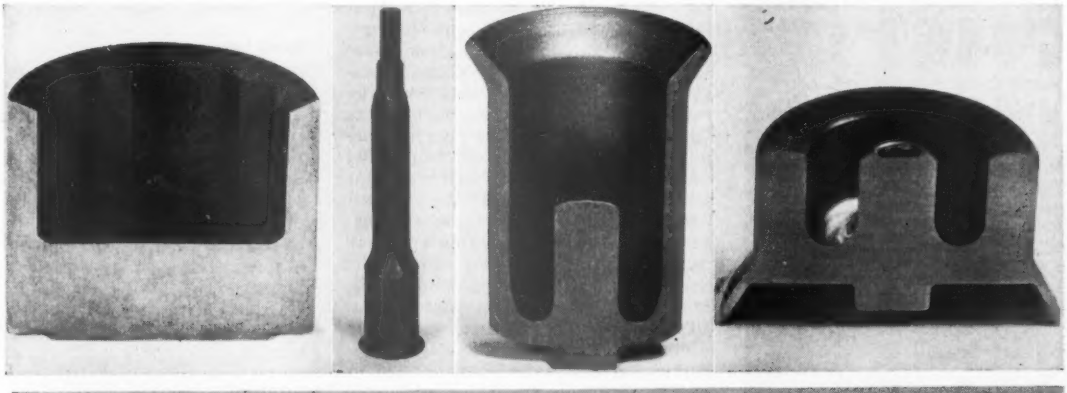
Conveyors move artillery and mortar shells from operation to operation, in the Liberty plant. Mullins has produced more than 2½ million shells by the Koldflo process.

Typical of these employed by Mullins at its Liberty plant, these hydraulic presses carry dies that accurately shape metal at room temperature.

fense. Already, more than 2½ million 105-mm. artillery shells and 81-mm. mortar shells have been made at the Mullins' Liberty plant in Warren, Ohio. This is the first plant in which the process was used exclusively.

During these years, considerable research has been conducted in extending the range of commercial application for the Koldflo process. The Mullins firm is rapidly completing a $2,600,000 facility at Warren for mass-producing commercial products by this method. Equipment will include four long-stroke, 3000-ton presses, and two 2000-ton presses, capable of shaping pieces weighing up to 100 lbs. In some instances, manufacturers with proper press equipment are being licensed to use the process in their own production.

Product designers now have a new field to explore, in eliminating design details that were formerly enforced by existing manufacturing methods. Koldflo, in many instances, will permit simplification of design and even substitution of one cold shaped part for a fabrication of several parts.



Examples of Koldflo cold-shaped steel parts. Left, lands or flutes can be produced on inner or outer surfaces, at top or bottom, in any length and combination. Second from left, this piece is round on inside and outside, at both top and bottom, while center section is square on inside and outside. Third from left, studs of any length are made concentric with both inside and outside walls. Right, complicated form is cold shaped by dies; thin-walled flanges are of any thickness, length or angle.

AUTOMATION

Safe Applications of ELECTRICAL CONTROL ON MACHINE TOOLS

Prepared by the Engine Manufacturing Engineering Department

Engine & Foundry Division
FORD MOTOR COMPANY
Dearborn, Michigan

This article expresses opinions held by some of us who are involved in the safe application of electrical control to machine tools, within the Engine and Foundry Division of the Ford Motor Company. Furthermore, the article should clarify some of the reasons why changes are requested in machine tool electrical diagrams submitted for preliminary approval.

One of the major reasons for changes is the lack of specifications, supplementary to the JIC Standards, which should outline our additional safety requirements. Inasmuch as the JIC Standards touch very lightly on the safety features which should be incorporated in the machine tool control circuit and omit many safety features which should be provided when locating electrical equipment on machines, additional requirements are necessary.

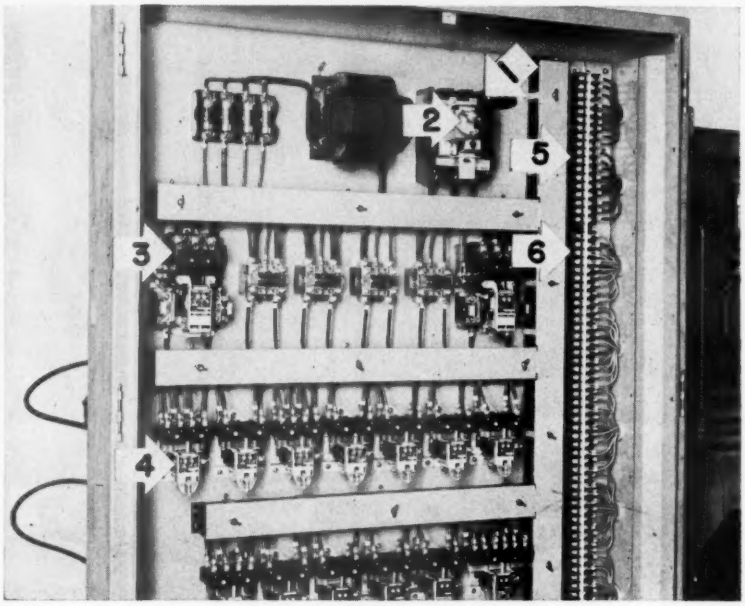


FIGURE 1

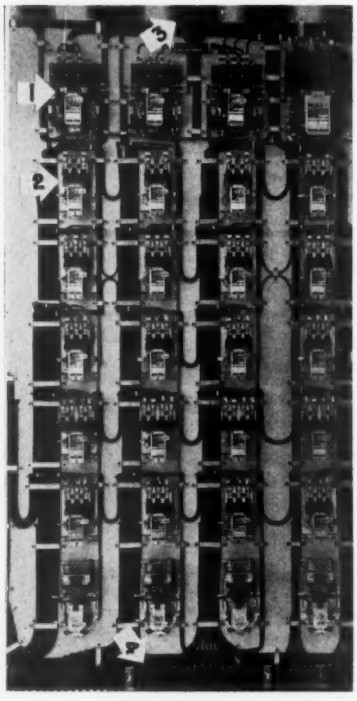


FIGURE 2

Another reason for many changes is the differences of opinion among electrical engineers as to what actually constitutes a safe control. As an example, some engineers design control circuits to permit complete flexibility of the machine while on manual operation. This arrangement may be permissible while the machine is being operated in the machine tool builder's plant with an engineer at the control station; but, it may prove disastrous, both to the machine and personnel, when an operator who is not technically trained is controlling the machine in our plant. Therefore, we require that the same interlocking which is necessary for the safe operation of a machine during the automatic cycle be used during the manual cycle.

As a user of machine tools, we are able to observe the arrangement of many electrical circuits and the many changes made in the past in order to obtain safe control. We have found many excellent safety features in circuits supplied by machine tool builders, which we try to have duplicated on other machines.

This article will deal with four subjects; namely (1) Control Panel Layout, (2) Motor Circuits, (3) Interlocking of Control Circuits, and (4) General Safety Requirements.

Panel Layout

One of the many unsafe practices is the faulty location of components within the control panel. Some of the safety features which should be incorporated in the control panel are:

The main line disconnecting means should be located in the upper portion of the panel, preferably in an upper corner (Fig. 1, Det. 1).

Other devices should never be located above this disconnect. This arrangement reduces the possibility of an electrician coming in contact with live wires while checking circuits, even though the disconnect switch is in the "off" position.

The disconnect switch should be mechanically interlocked (Fig. 1, Det. 2) with the panel door, or doors, so as to prohibit entrance into the panel with the switch in the "on" position. This disconnect

switch should have provisions to accommodate three pad locks and permit locking in the "off" position **only.** Three locks will permit three different categories of repair men, such as hydraulic, machine repair, and electrical men, to perform their work simultaneously under safe conditions.

The supply lines should go directly to the disconnect switch rather than through terminal blocks. On machines where it is necessary for the power to be supplied through collector rings, such as radial drills, a disconnect switch should be provided at the point where the lines enter the machine. This switch would enable repair men to disconnect all power from the machine before performing their work.

Devices with terminals at 220 or 440 volts potential, such as motor starter (Fig. 1, Det. 3 and Fig. 2, Det 1), power circuit fuses, etc., should be located above devices with 110-volt terminals, such as relays, timers, etc. (Fig. 1, Det. 4 and Fig. 2, Det. 2). This arrangement eliminates the necessity of an electrician reaching above 220 or 440-volt circuits while testing the control circuit.

Terminal strips used for connections to devices operating at 220 or 440 volts (Fig. 1, Det. 5 and Fig. 2, Det. 3), such as motors, should be isolated from terminal strips used for connections to 115-volt control devices (Fig. 1, Det. 6 and Fig. 2, Det. 4). There should be no stacking or piling of terminal strips.

A color code should be used to distinguish power circuits operating at 220 or 440 volts from control circuits operating at 115 volts. The recommended color scheme as stated in the JIC Standards is black or grey for power circuits and red for control circuits. This arrangement enables an electrician to readily identify the high voltage wiring.

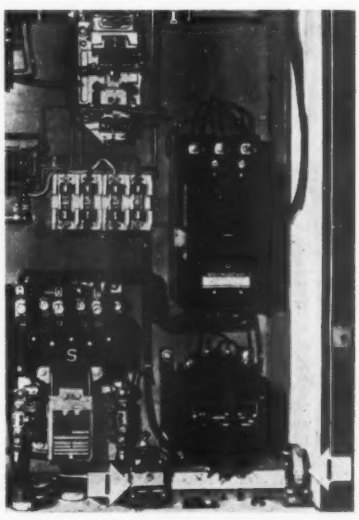


FIGURE 3

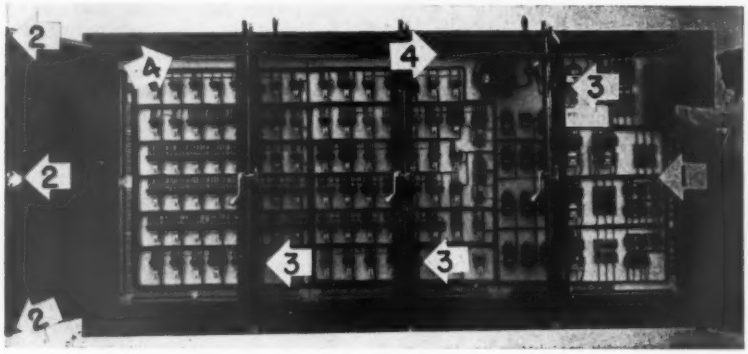


FIGURE 4

Devices that require servicing by trades other than electrical should not be mounted in the electrical control panel. As an example, pressure switches (Fig. 3, Det. 1) mounted inside the control panel, which is contrary to JIC Standards, may expose hydraulic repair men to high voltages while performing their work.

Figure 4 shows a well laid out, large floor-mounted panel. This panel has the 440-volt units in one section (1), positive three-point door latch (2), mechanical door interlock (3), and panel illumination lights (4).

Motor Circuits

All motors should be controlled by under - voltage release circuits. While it is mandatory according to JIC Standards to use magnetically operated motor starters which ordinarily afford under-voltage release circuits, some engineers connect these starters so as to omit this feature. Without this under-voltage release, motors will start automatically upon return of power after a power failure. This could be very hazardous to both personnel and equipment.

The overload relays for protecting a motor should be effective at all times. Many circuits by-pass these overload relays when the "start" button is held depressed, causing the motor to over-heat and be damaged (Fig. 5). The overload resets should be contained within the control enclosure and be available only to authorized personnel.

Plugging or zero speed switches used for "plug stopping" motors should either be equipped with a lock-out coil or used in conjunction with a safety relay (Fig. 6, Det. 1). This would prevent the drive motor from accidentally starting in reverse when the drive is rotated manually.

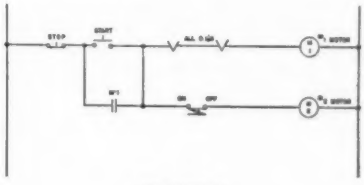


FIGURE 5

Now comes the big problem of adequate over-current protection for motor branch circuits. According to our interpretation of Article 670 of the National Electric Code, it is permissible on machine tools to have a 100-ampere fuse protecting a size #14 conductor when a 440-volt supply is used. In our opinion, this value is too high due to the high available short-circuit currents that we have in our plants. In fact, we have definitely proved by tests that under short-circuit conditions the insulation

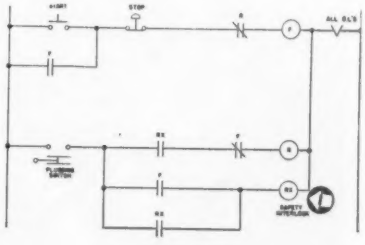


FIGURE 6

on a #14 conductor will be damaged before a 100-ampere fuse will open the circuit. Therefore, we limit the size of the fuse protecting a #14 conductor to 60 amperes.

While we are taking a calculated risk on some of the smaller size heater elements being destroyed,

we feel that the conductors, which are usually the most difficult part of the branch circuit to replace, would be protected. This fusing method of rating the fuse at 400% of the conductor carrying capacity was developed by the Ford Electrical Sub-Committee, whose members represent all divisions of the Company. Therefore, this method is in effect throughout the Ford Motor Company. Other organizations are now working on this problem of obtaining adequate protection without fusing each motor circuit separately.

Interlocking of Control Circuits

Generally speaking, today's machines are built to run automatically. Figure 7 shows a modern automatic, in-line, transfer-type machine for performing machining operations on cylinder blocks.

However, there are occasions when it is necessary to operate individual machine functions with push buttons, that is, manual control. Since the stop button is effective at all times, we are able to stop the machine at any point in its cycle. It is necessary then that all functions be manually operative. This means a complete manual cycle. If the operator must shift valves by hand to accomplish a manual cycle, he will all too frequently shift the wrong valve at the wrong time. The provision of push buttons for manual control will eliminate the necessity for valve shifting, but it presents another problem. This manual cycle must be interlocked just as effectively as the automatic cycle, making it impossible to operate the machine incorrectly.

Motors on a machine should be started from one location only (Fig. 7, Det. 1). This location should be at a vantage point where the operator has a clear view of the activity around the machine. This arrangement would prevent a repairman from re-starting the motors at the point of repair while a set-up man is changing tools. However, multiple **stop** buttons are recommended and should be used where necessary.

The cycle of a machine should not be started from multiple locations, except where more than one operator is required and the cycle start buttons are connected in series. It is recommended that each operator's station be provided with two cycle start buttons to ensure that the operator's hands are clear of moving parts when the cycle is started.

Two-position, double-solenoid operated, 4-way valves should be used to control all hydraulically actuated clamping mechanisms. If single-solenoid operated, spring offset valves are used for this application and a failure occurs in either the relay or the solenoid, an unsafe operation will result. Spring off-set valves will not "fail safe" when used on clamping circuits.

Hydraulically actuated indexing mechanisms should be controlled by three - position, spring - centered, double-solenoid operated, 4-way valves. With this arrangement, if the machine is stopped during the transfer portion of the cycle, the transfer bar will remain stopped when the machine is re-started. This permits easier reversal of the transfer bar in the event that parts are jammed or someone is caught in the machine while parts are being transferred.

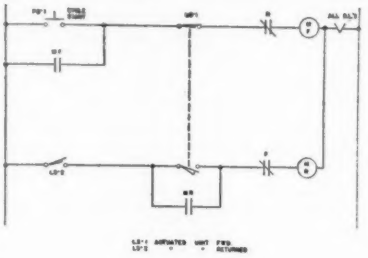


FIGURE 8

Hydraulically actuated heads should not depend on the energizing of either a relay or a solenoid for changing from rapid traverse to feed rate. This is a "fail safe" feature which prevents the head from performing the drilling operation at rapid traverse rate when relays or solenoids fail.

On machines with multiple heads, each head should reach the full-depth of its machining operation and return to its starting position before the part is transferred to the next station. This is necessary due to the possibility of extensive tool breakage when parts are transferred before the work is completed. For example, a part could be transferred into a tapping station without all of the holes being completely drilled. It is also desirable to reverse heads independently at the completion of their operation to prevent drilled holes from becoming oversize.

Before a part is machined it must be properly located and clamped securely. Since the locating device is quite precise, an error in the deposit point of the part after transferring will cause an interference between the locating device and the part. When the locator reaches its forward position, the clamps are operated which would clamp the part out of position. At the same time, the locators could be forced to return. Normally, the next function is bringing the heads in, which is undesirable in this situation. For this reason the heads should not be allowed to start forward unless the locators are in and the clamps are in their clamped position.

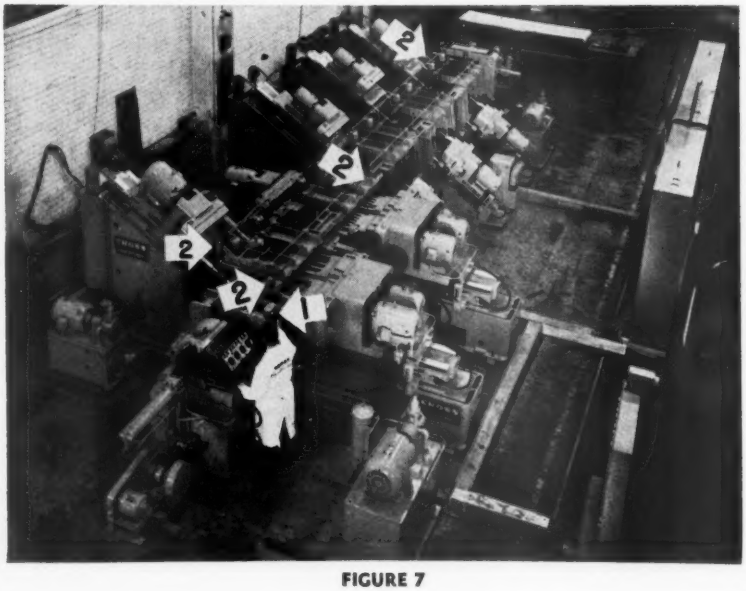


FIGURE 7

One method of controlling a tapping head is by using separate limit switches to indicate the extreme forward and return positions of the tapping unit. (Fig. 8).

In some circuits, the forward limit switch de-energizes the forward contactor which in turn reverses the tapping motor and head. The reverse movement is stopped by tripping the return limit switch. **De-energizing the forward contactor will cause the reversal of the tapping motor.** Now, if the returned position of the head begins to vary, due to brake failure or wear, we will reach a point where the return limit switch will be overridden. This will cause the return contactor to re-energize, thus damaging the machine. This failure can be overcome by using the forward limit switch to energize the return contactor.

The extreme positions of each machine motion should be indicated with limit switches, which would be used to determine the sequence of the machine cycle. Sequence valves and pressure switches should not be used for this purpose, due to the fact that false indications are obtained if pressure builds up for any reason. Both normally open and normally closed sides of these limit switches should be used to serve as a check on themselves, guaranteeing that the switch not only trips when it should, but also releases when it should.

An arrangement of this type (Fig. 9) will prevent the faulty operation due to limit switches sticking in their tripped positions. Precaution should be taken to prevent starting a machine motion by accidentally tripping a limit switch.

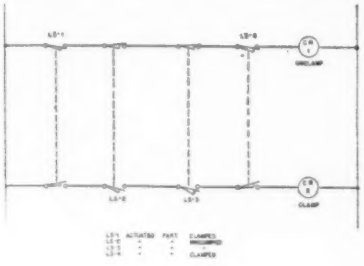


FIGURE 9

Most of the machine tool circuits operate at 115 volts a-c obtained from an ungrounded secondary of the control transformer. With this arrangement, there is a possibility of machines operating out of sequence, thereby endangering personnel and machinery, due to the occurrence of two accidental grounds on the side of the control circuit containing the interlocking contacts, pushbuttons and limit switches. To combat this danger, we are requesting the installation of ground detector lights which will indicate the presence of one ground.

The circuit could then be cleared before the occurrence of a disastrous second ground. This is a major step in preventive maintenance, due to the fact that we are able to correct faults before serious damage has resulted. Sometimes, by observing the action of these lights in relation to machine cycle, it is possible to locate the device which is grounded such as a limit switch or solenoid without shutting the machine down and performing extensive tests. The system of ground detector lights that we are using consists of two, transformer-type, indicating lights connected in series across the control circuit with the centerpoint between the lights grounded (Fig. 10, Det. 1). With this arrangement, when the circuit is clear both lights are burning at half brilliance. As soon as a ground occurs, one light will go out and the other will light to full brilliance.

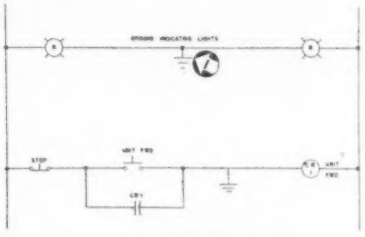


FIGURE 10

On machines using shunt-wound d-c motors, there is always the possibility of field circuit failure which causes the motor to "run away." It is therefore desirable to provide a field protection relay which will shut off the machine in case of field failure.

The automatic loading and unloading methods in connection with machine tools as pioneered by the Ford Motor Company are being applied in increasing magnitudes (Fig. 11). These methods require safety in circuit design previously considered unimportant due to the continued presence of the machine operator. For example, few machines have been equipped with a limit switch to indicate that a part is in the unload station and to prevent the machine from ejecting another part. When automatic methods are used, this switch becomes a requisite.

A relay should be provided to indicate that the load station is in a position to receive a part. Also, a limit switch should be provided to indicate the part is properly loaded. When these provisions are made after the machine and panel are installed, it requires considerable reworking of the machine circuit and panel. The additional equipment must be located wherever space permits, rather than in a group as is most desirable. Subsequent trouble-shooting by electricians becomes hazardous due to the confused nature of the additions. Mounting of limit switches on the load station is often very difficult because mounting provisions are not available or other devices occupy the most suitable area. It is rarely possible at such time to mount switches where and how they should be, resulting

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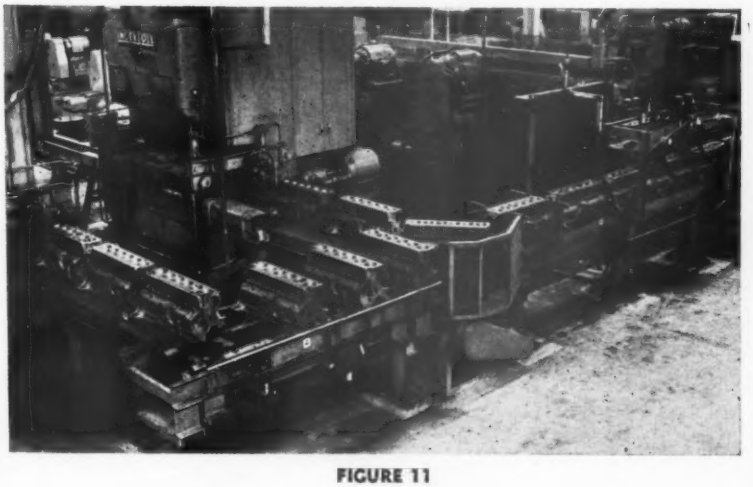

FIGURE 11

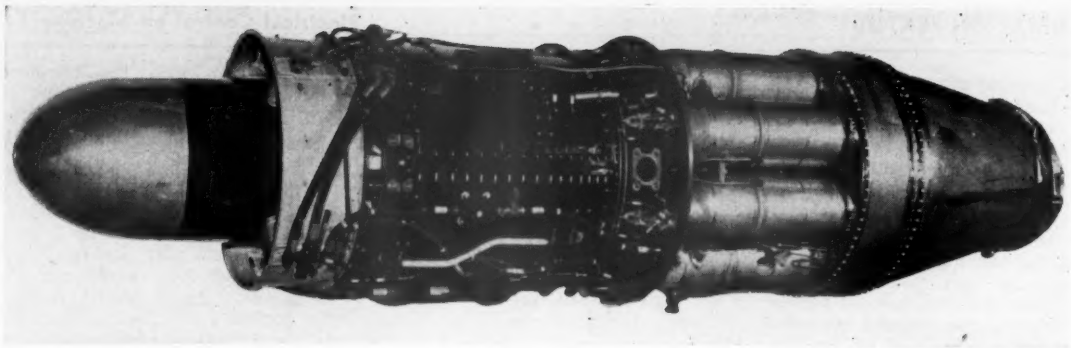

FIGURE 1

JET ENGINE TOOLING

by C. L. Sadon
Aircraft Gas Turbine Division

GENERAL ELECTRIC COMPANY
Lynn, Massachusetts

Many of you have seen the Air Force in action . . . first-hand or on film. Underneath much of this action, and not belittling the pilot and his skill and daring, has been General Electric's famous J-47 jet engine (Fig. 1). Behind the engine are thousands of hours of tool engineering for which we in our profession can be justly proud.

While the gas turbine is generally thought of as an instrument of war, its application to peacetime use is out of the experimental stage. It is used in power plants for public utilities; it is used to power one of America's newest locomotives, "The Big Blow".

By the spring of 1942, General Electric had built its first jet engine, a modification of the English Whittle engine. Since then, various models of radial-flow and axial-flow compressor type engines have developed. While the present J-47 has substantially the same frame size and weight as its predecessor, the J-35, it develops approximately 5,000 lbs thrust compared with the 4,000-lb rating of the J-35. More recent developments have increased its output considerably. This engine powers North American's swept-back-wing Air Force fighter, the F-86.

Buckets and Blades

Perhaps the most important parts of the gas turbine that bring problems to the tool engineers are the buckets and blades; the buckets, because of the extreme toughness of the high-temperature alloys used and the intricate mechanical fastening to the wheel (popularly known as the Christmas tree dovetail); and the blades, because of their complicated airfoil shapes and required high quantity production.

On our buckets, we forge the airfoil section to size to a total tolerance of 0.005″ of true shape, and a tolerance of 0.015″ on thickness. From the numerous forging steps shown here (Fig. 2), you can appreciate that the forging of this part is more complex than the more common "heat up and forge" parts. The buckets must operate red-hot; and, therefore, it is understandable why the material does not flow freely in the forging die.

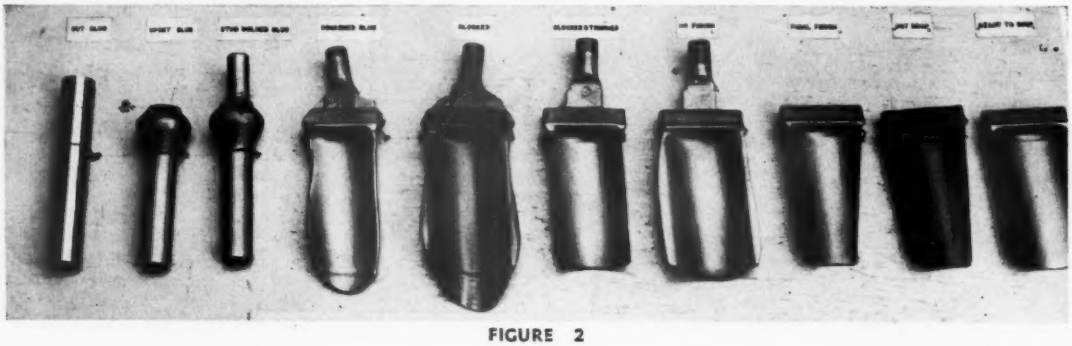

FIGURE 2

In order to reduce the material defects to a minimum, any surface impurities in the slug are removed by centerless grinding; and, after each forging stage, the forging is grit-blasted in order to rid it of all scale which might be impacted into the material in subsequent operations. The high cost of the bucket material makes it necessary to use a welded on, low cost, tong-hold. Even at that, the material cost has been around $6.50 per piece.

The airfoil sections are generally inspected, on production, with guillotine gages. To make sure of our quality, however, spot checks are made with the Pantoscriber (Fig. 3). With this instrument, the contour of the blade section is contacted by two disks of the same diameter as the cutters which cut the lacquer on the glass.

The image on the glass is projected onto a screen (Fig. 4), where the image of the blade outline is compared with the master outline on the reticle, which is also projected. In this way, it is possible to evaluate not only the correctness of any blade section but also the relation of one to the other and all to the dovetail—a very important check.

Machining the Dovetail

The most difficult operation on the bucket is the machining of the dovetail. Milling and broaching has been tried, but today it is generally conceded that grinding is the most practical method. For this purpose, General Electric and Jones & Lamson developed a two-way dovetail grinder (Fig. 5).

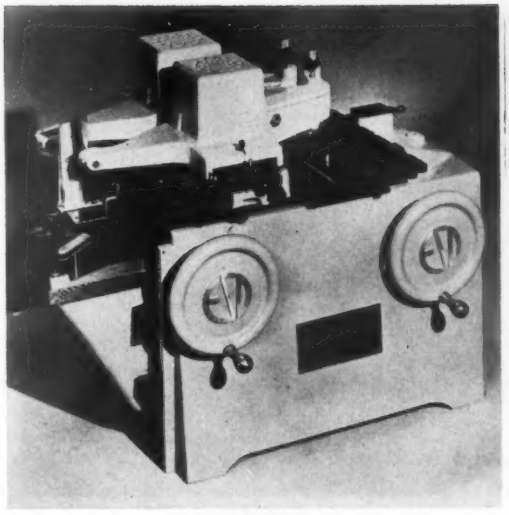

FIGURE 3

This grinder is a specialized, single-purpose machine, designed around the proven principles of the thread grinder. Its various elements are so arranged as to give it the utmost rigidity, repetition of accuracy, ease of operation, and operator safety. The machine has two 20″ wheel diameter thread grinding heads opposing each other. Both heads are standard, except that the right-hand head is a mirror-image of the left-hand head. Each head is powered with a 20-hp variable speed d-c motor.

Safer clean working conditions for the operator were obtained by completely hooding the machine. The oil-vapor and mist problem has been eliminated by the use of an electronic oil-mist collector. The clean-

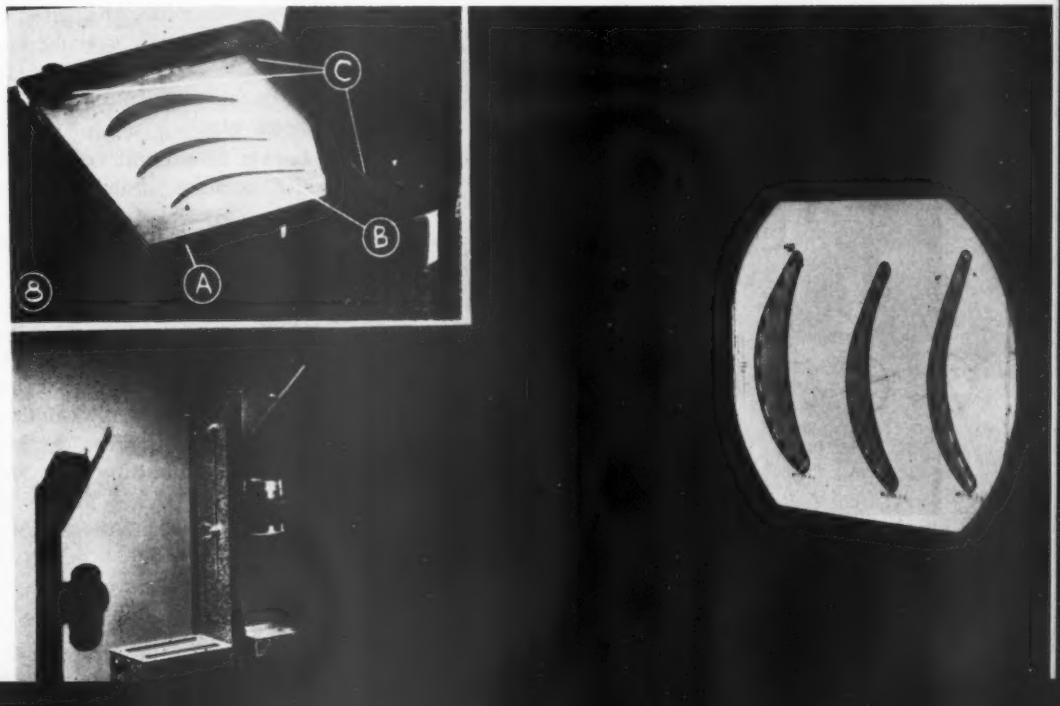

FIGURE 4

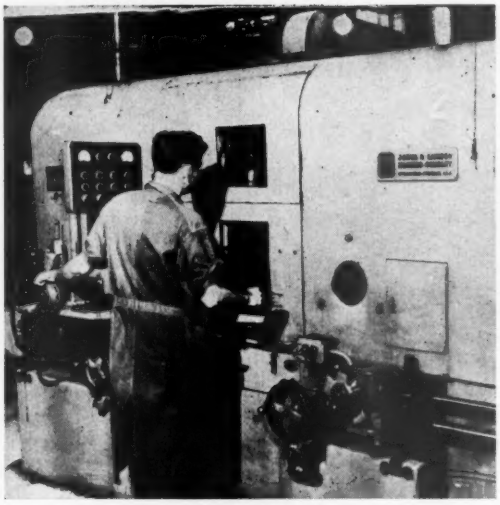

FIGURE 5

cut appearance of this hooding demonstrates that it was not the usual after-thought of putting a guard here and there, but the result of careful pre-planning worthy of the award presented by our safety department as "the safest machine in the division".

The operation of the machine has been simplified to the point where it is a push-button job. The operator simply inserts the shuttle into the locating nest (Fig. 6). By releasing a foot-operated valve, the shuttle is hydraulically clamped. He pushes the starter button; the door closes; the coolant valves open; the vertical slide reciprocates; the wheels are fed in a pre-determined amount, for each stroke, until the wheel slides come to their positive stop; the vertical slide stops at its lower position, the coolant is shut off; and the door opens.

A rheostat is arranged with each wheel slide so as to maintain constant surface speed

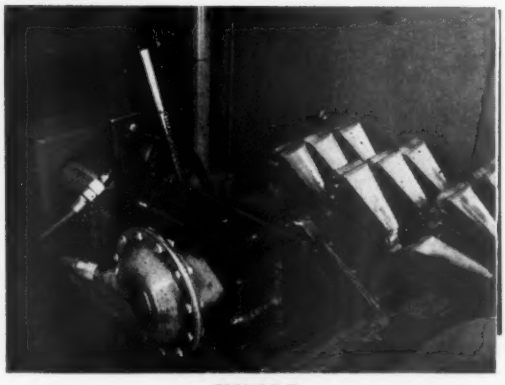

FIGURE 7

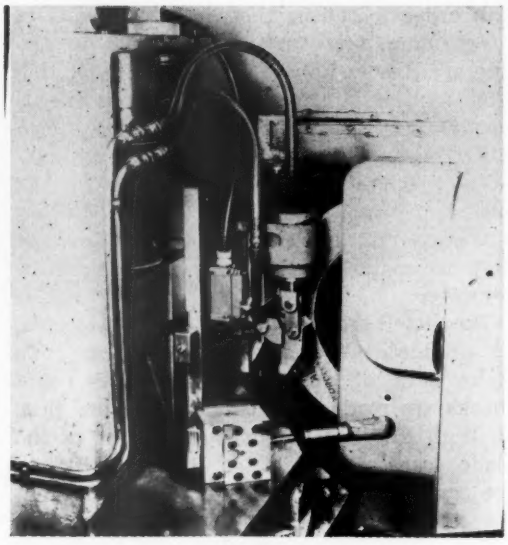

FIGURE 6

of about 8,500 sfpm for each grinding wheel, regardless of the wheel wear.

A hydraulically operated vertical slide carries the bucket, which is located in a shuttle, between the wheels. The slide has pre-loaded ball bushings which are protected against grit and dirt by the use of accordion-type boots. The speed travel of the slide can be regulated from ½ to 8½ fpm.

The basis for obtaining the accuracy required of this machine lies in the diamond dressing cams. The cams have the shape of the dovetail, with the height of the cam lobes to the height of the dovetail serrations in 1:1 ratio, and the pitch of the lobes to the pitch of the serrations in 2½:1 ratio. With such a favorable ratio, the generation of accurate form and pitch spacing is simplified. Because the wheels are dressed before the final cut is taken, excellent accuracy of the product can result.

The bucket is ground from a rough forging, which because of its shape and forging die mis-alignment, generally requires better than 0.100" of stock to be removed on a side at the base.

The bucket is held in a block or shuttle where it is located at two extreme cross-sections by guillotine jaws. A stop-button positions the inside of the gas chamber lengthwise. The block was designed to reduce the manual labor required to load it to a minimum by eliminating the usual screw tightening of the bucket in the block. Each grinder uses three of these blocks. While

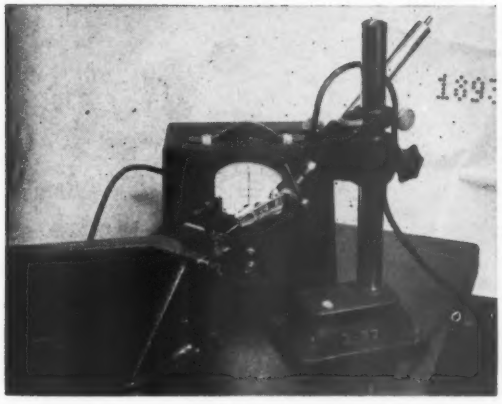

Figure 8

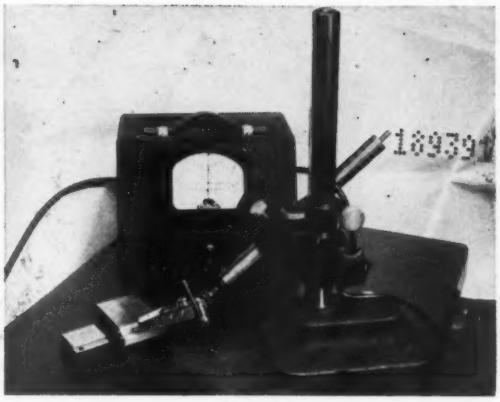

Figure 9

grinding, one block has the excessive oil dripping off and the other is being loaded.

At the work loading station on the grinder, the spring pressure on the block is released, by energizing the air cylinder (Fig. 7). The ground bucket is then easily removed, and a new bucket inserted. The release of the air pressure allows the spring cover to secure the bucket tightly enough to transfer it into the machine where it is rigidly held during the grinding cycle by a hydraulically operated toggle clamp and plunger.

Inspecting the Dovetail

To grind such a difficult shape as the dovetail to close tolerances in tough material is one thing; to measure it in terms of tenths is another. Except to measure the width of the dovetail, which is done by measuring over appropriate size wires, the dovetail is usually inspected on an optical comparator.

It has long been recognized that a comparator, originally conceived and built to explore the shape of thin pieces, is not the best tool to measure these dovetails, which are more than 2" thick; and yet, to find and build something better is still a task challenging the tool engineer.

The measuring of the dovetail can be compared with the measuring of a thread, for both have form, pitch, thickness or diameter and taper errors to be evaluated. However, in addition to all these, in the dovetail we have to evaluate the mis-match of one side to the other. The measuring problem is even more complex because, in the measuring of pitch, we are concerned with the pitch of planes rather than of points as on a thread.

The most exact and dependable method of measuring grinding results that we have yet found is the coupon method, which includes charting the findings.

Shown in Figure 8 is a coupon set up to check the vertical pitch and the relation of one side of the dovetail with the other. These coupons are made from the same material as the buckets and are ground with the same grinding cycle. Instead of the blade section, they have a straight-sided rectangular section which is accurately ground so that its surfaces can be used for reference.

Parallelism and the distance of the first to the last serration are also checked in this setup (Fig. 9).

On the pressure face, its pitch and parallelism are explored, using a similar electronic gaging setup. Because of the reference surfaces on the block, the relation of the shapes on both sides can be accurately evaluated. As Lord Kelvin said: "To know what you are speaking about, you must be able to measure

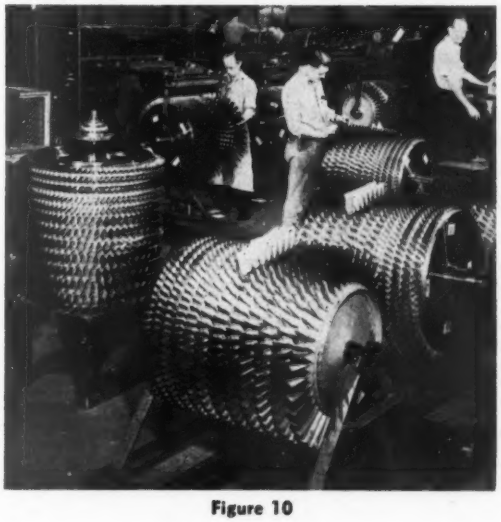

Figure 10

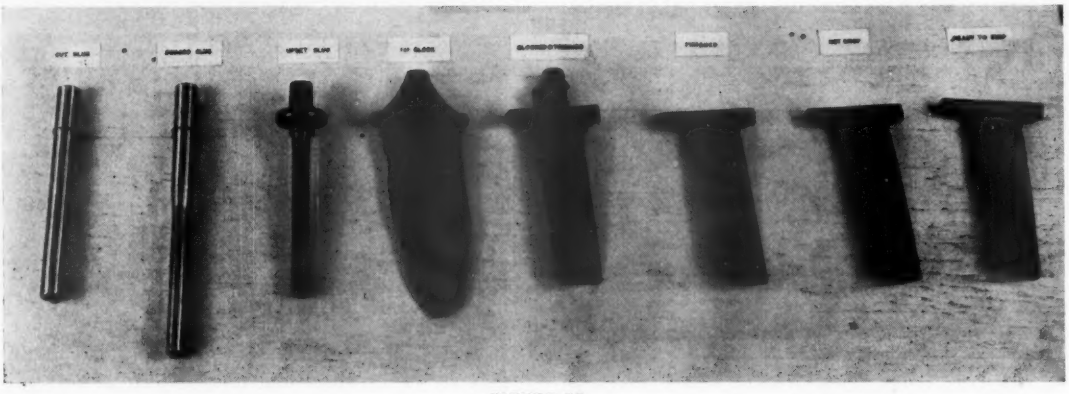

FIGURE 11

it and express it in numbers. When you cannot measure it—when you cannot express it in numbers—your knowledge is of a meager and unsatisfactory kind." Through the use of the coupon method, we have measured and expressed our findings in numbers; therefore, we have gained knowledge that has helped tremendously to improve our quality.

Compressor Blade Manufacture

In the making of compressor blades, the primary problem is in finding methods and equipment to produce the tremendous quantities of blades that the jet program requires (Fig. 10).

To make compressor blades, several methods are currently in use: 1. Precision forging, where the blade section is forged to size to very close tolerances; 2. Precision rolling, where, instead of the hammers or presses, rolls are used; 3. Rough forgings, which are machined all over; 4. Powder metallurgy, where a powdered metal is pressed into shape and then sintered and otherwise treated to give it strength; and, 5. Precision casting, where by the use of the lost-wax method, blades can be cast to accurate shapes.

Each process has certain advantages under certain conditions and disadvantages under others. For instance if, in the event of all-out mobilization program, all the blades had to be finished forged, whether hammered, pressed or rolled, not only the procurement of forging machines and diemaking equipment would present a serious problem, but also the short die life and the large number of experienced die sinkers required. If all the blades were rough forged and then machined, it would take better than 40,000 spindles, and more than one-million square feet of floor space for the machining operations only. The sintered blade, while suitable in some places in the compressor, is still restricted in others. The cast blades have never proved to be very successful in jet engine applications, although considerable success has been experienced with them in other applications.

We in Lynn, for several reasons, have been using the precision forging method. We started that way because it was an expansion of the "know-how" we already had gained in forging steam turbine buckets. Throughout the years, in forging these compressor blades to size (incidentally, a job that many said could not be done), we have constantly improved our technique.

Here are the steps employed to forge one of these blades (Fig. 11). As with the bucket, we start with centerless-ground stock. The slug is swaged and upset to bring it closer to the die conformity, then blocked, trimmed, finished forged and hot dropped. After each of these operations, the blade is grit-blasted to assure a good forging. Each blade is magnetic-particle inspected to find cracks, pits, and folds. Inspection of shape is done by the use of guillotine gages. The Pantoscriber is also used for spot inspection.

The blade edges are ground on a Fitchburg Van Norman two-wheel grinder. The blade is located and held by the airfoil section, therefore assuring the accurate relation of airfoil to edges. We locate the blade by the airfoil and ground edges, and drill the ends of the dovetail for the locating centers in the broach.

We are using a 15-ton, 66″ stroke, 4-station LaPointe broach for this work. When these broaches were first set up, we had to be satisfied when we got more than 1,500 blades

. . . Continued on page 82

PART ONE of this Article appeared in the June 1953 issue of TOOLING and PRODUCTION

CARBIDES IN THE PRESS ROOM

by Lester F. Spencer
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Die Construction

It is in such applications as blanking, piercing and notching sheet metal, in both light and heavy gages, that the advantages of carbides can be most fully realized. However, economical production must necessarily be based on long runs since the cost of the carbide press tooling is from two and one-half to three times that of a similar die made from conventional tool steel. This is required in order to realize a return on the original investment. In addition, the use of carbide will assure a good quality over a time period far in excess of that experienced with steel dies.

The carbide nibs for use in blanking or drawing can be furnished in virtually any shape; usually nibs or inserts for round hole draw dies are in the form of rings, and nibs for irregular shaped draw or blanking dies are in the form of split sections or segments. Symmetrically shaped dies, exemplified by square or hexagon shapes, can also be produced in solid form.

Regarding the shape and size of the carbide die nib, it must be remembered that they cannot be as readily machined as steel; operations such as grinding, lapping or diamond boring being essential. Thus, the nibs should be of such design as to permit the use of a grinding wheel or other tools for finishing, in order to obtain the proper contour. This often makes it necessary to employ die segments or a split die design rather than a single solid insert.

Outside Diameter of Nib Range		Shrink Allowance
Minimum	Maximum	
0.437	0.562	0.0013 to 0.0018
0.562	0.687	0.0016 to 0.0021
0.687	0.812	0.0021 to 0.0026
0.812	0.937	0.0025 to 0.0030
0.937	1.125	0.0028 to 0.0033
1.125	1.375	0.0035 to 0.0045
1.375	1.750	0.0038 to 0.0048
1.750	2.000	0.0043 to 0.0053
2.000	3.000	0.0045 to 0.0055
3.000	3.500	0.0055 to 0.0065
3.500	4.000	0.0065 to 0.0075
4.000	5.000	0.0070 to 0.0080
5.000	6.000	0.0080 to 0.0090
6.000	7.000	0.0090 to 0.0100

Table II—Shrink Fits for Carbide Rounds.[2]

In the blanking operation, it is recommended that heavy nibs be employed and, in addition, these nibs must be held rigidly in place. The use of heavy nibs means that additional stock is available for regrinds, thereby further multiplying the already long life of a die.

As in the use of steel dies for blanking, angular shear is employed on carbide dies; the amount being about twice the thickness of the stock when the stock is 1/16 inch or less. In the event that the material thickness is greater, the angular shear should equal the thickness of the metal. The purpose of the shear angle is to reduce the peak load. In an operation such as punching or perforating, the shear is usually placed on the punch to prevent distortion of the sheet. In a blanking operation the angular shear is placed on the die so that distortion does not occur on the blank.

The die clearance required for a blanking operation will vary with the material; this factor being of importance since it gradually increases the area of the die opening. This permits escape of the blanks as they are cut, eliminates wedging and jamming as successive blanks are passed through, and provides at least a nominal amount of cutting rake clearance. The amount of this clearance between the punch and the die is still open to some question.

As a starting point, it is recommended that for materials such as brass and soft cold rolled steel, a clearance value of from five to seven percent of the stock thickness be employed. When medium cold rolled steel is employed, the recommended clearance value is from seven to ten percent of the thickness. On hard rolled materials, this clearance value should be from nine to twelve percent of the material thickness.

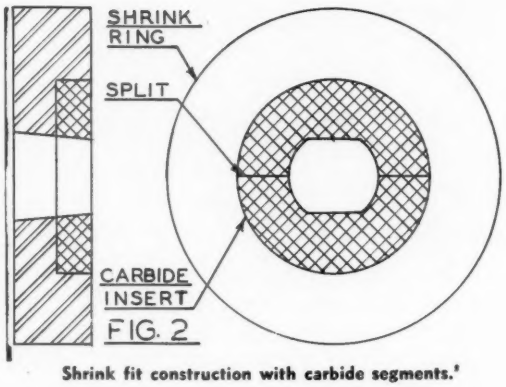
A one-half degree taper is the general practice and while this value may seem low to an inexperienced designer, it does furnish clearance necessary for the operation. At the same time, it permits grinding an appreciable amount of stock from the face of the die in successive resharpenings before the opening becomes large enough to produce an oversized blank.

The intricacy of the part being produced governs the delicacy of the punch. Thus, the smallest cross sectional dimension of the punch should not be less than the metal thickness, and in addition, columnar design in the punch should be avoided. The latter may be accomplished by maintaining for unsupported carbide a height to thickness ratio not greater than three to one. As mentioned previously, the depth of nib for a specific blanking die should be appreciable; usually the production run that is contemplated is the governing factor. Thus, a minimum of one-half inch is recommended as the depth plus sufficient stock for the number of regrinds desired during the life of the die. A value of 0.005 inch of stock per each regrind can be used.

Carbide nibs on either punch or die may be attached to the matrix by a number of methods, including brazing, wedging, shrink fitting, keying or bolting. The particular method employed is dependent upon the specific application and design of the die. Here again, the suggested methods are for guidance and where specific information is required it is best to consult the carbide representative and benefit from his valued experience.

Brazing is seldom employed in the fabrication of blanking dies since it is usually quite difficult to disperse the strains set up during the brazing operation. This in combination with the continuous pounding of the die in service will tend to work-harden the braze which may result in misalignment and premature failure.

In the event that a solid carbide nib can be employed, a shrink fit such as is illustrated in Figure 2 can be used. However, where segmented or sectional nibs are employed, shrink fits are usually undesirable since it is difficut to obtain a uniform shrinkage and support on all inserts within the same matrix. This is particularly true in the event that irregular shapes are employed since there is always that possibility of shifting of the segments. This condition often

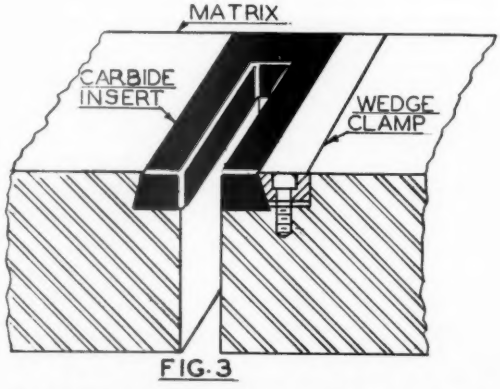


Shrink fit construction with carbide segments.[1]

leads to difficulty in finishing the nibs or maintaining a uniform clearance around the entire periphery of the shape. Where shrink fits are acceptable, the recommended interference for cylindrical shrink fits is indicated in Table II.

One of the more approved methods of mechanically mounting the carbide nib is the wedge construction illustrated in Figure 3. This wedging effect is obtained by having a three to five degree taper on the outer surface of the carbide insert; a matching taper is also placed upon the steel wedge. The wedge is pulled in between the matrix and the carbide section and is secured by cap screws. An accurate fit is essential since the wedge has a double function, namely to accurately locate the insert within the matrix, and to give the carbide adequate support.

For certain tool designs, mechanical mounting by the use of plugs and bolts is the most satisfactory. This type of construction, Figure 4, can be used in attaching a carbide nib to a die or to a punch. In Figure 4 this



Wedge type method of holding carbide insert in matrix.[1]

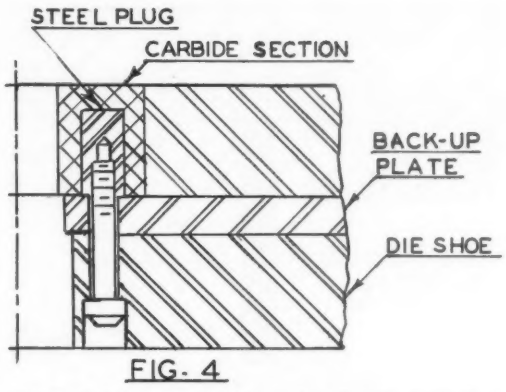


FIG. 4

Method of fastening carbide section directly to matrix.[5]

procedure is shown in die construction. Figure 5 illustrates various types of plugs: (a) a tapered steel plug with tapped hole; (b) a square steel plug with tapped hole; and, (c) a bimetal plug with tapped hole.

A satisfactory method for this type of mechanical holding would be the use of an insert made either of mild steel or bronze and placed directly in the carbide so as to facilitate threading and fastening. Small inserts can be placed in the carbide by brazing, however this method has limitations.

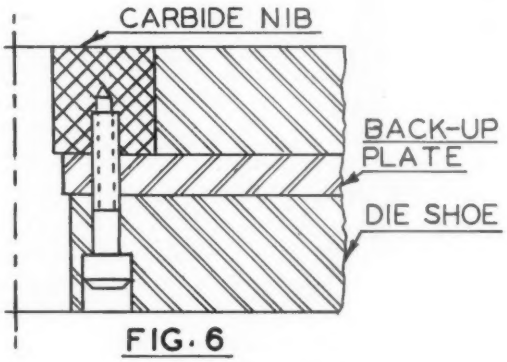


FIG. 6

Threaded carbide insert.[1]

Thus, when the fastener or insert is internal and greater than one-half inch in diameter, the steel insert is divided into sections and the sections can be brazed. Brazing a single section is not recommended. In this manner, the layers of brazing material can more readily compensate for either contraction or expansion forces caused by the difference in these values between the steel insert and the carbide nib.

A method of mechanical holding which has been quite successful is that illustrated in Figure 6. In this method, the carbide nibs have tapped blind holes and are held firmly to the die with cap screws. It is very important that the shoe is not jig bored before the carbide is prepared since it is almost impossible for carbide manufacturers to guarantee center line distances between threaded holes. A far more acceptable procedure is to employ the carbide nib as a jig in marking the holes on the back-up plate before drilling. Due to the fact that the thread in the carbide nib is placed prior to final sintering, a loose

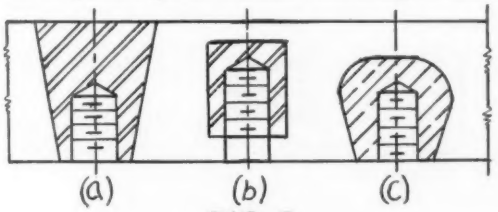


FIG. 5

Attaching carbides with plugs.[6]

fit on the bolt may be expected; however, a satisfactory holding power can be obtained by placing the cap screws under tension.

Figure 7 illustrates a steel ring clamped with screws against a shoulder on the outside diameter of a carbide nib. In this procedure, the shoulder is preformed on the carbide insert.

Where attachment of punches onto a steel body is required, several suggested procedures are given in Figure 8. For light draw work, the brazed punch may be used, but whenever possible, the suggested methods of mechanically attaching the carbide nib are preferred.

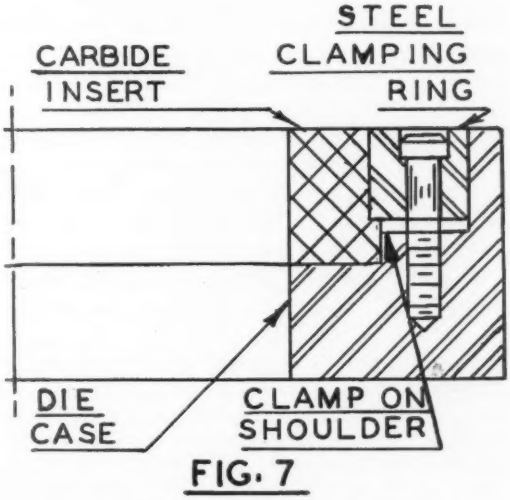
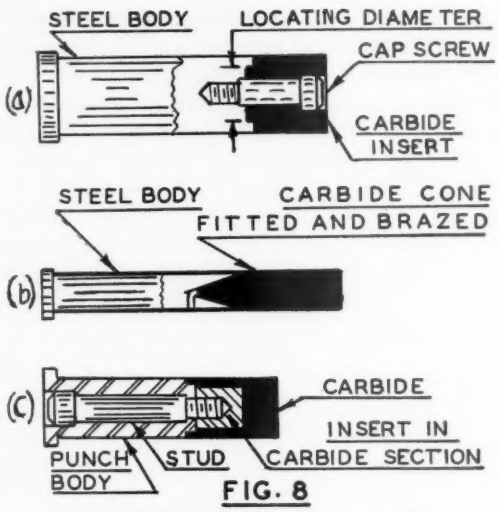


FIG. 7

Mechanical clamping of carbide die section.[6]

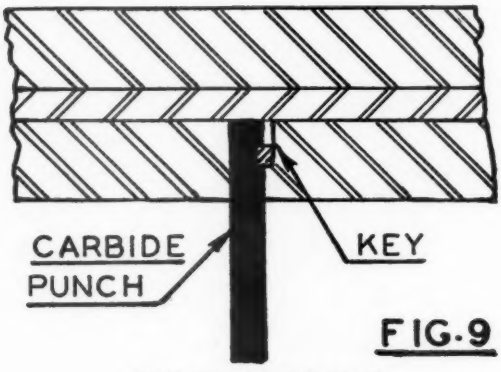


Methods of attaching draw punches.[1]

In Figure 8, the design as indicated by (a) is known as the screw stud type. Where a cap screw head will not interfere with the function of the punch, attachment by means of a cap screw[5] through a preformed hole in the carbide is efficient and practical. The nib for this design is preformed with the attaching hole in the center for the cap screw. The locating shoulder diameter which mates into the shank is also preformed.

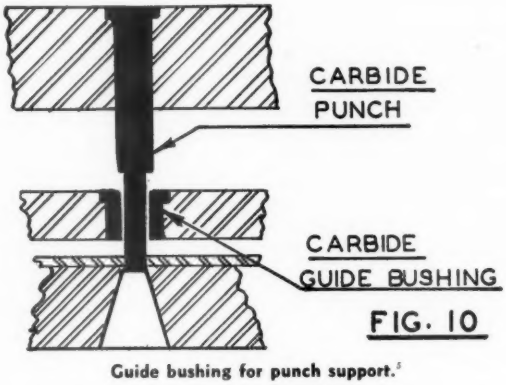
The design indicated by Figure 8 (b) is the brazed type. Where the punch is long but too small for a stud, and the work performed is comparatively light, the cone fitted and brazed type is often used. Where the entire area at the end of the punch must be solid and continuous, the mechanically attached type as indicated in Figure 8 (c) can be employed. In this case, the carbide section is sufficiently large so as to permit the blind hole type of mechanical attachment. For punches assembled in this manner, the carbide is provided with a machinable material[5] imbedded in a blind hole so that an attaching stud or screw can hold the carbide firmly to the steel body of the punch. Where this method is used, it is recommended[5] that a locking device be used.

Another mechanical method of attaching punches to the matrix is known as keying;



Holding a punch with a key.[2]

this principle being used on either fixed or floating punches. This method of attachment is illustrated in Figure 9. It is recommended[2] that one should avoid grinding deep grooves or sharp re-entrant angles on the punch when this method of holding is employed. To minimize mis-alignment and decrease the tendency of the punch to break, the use of a carbide bushing as illustrated in Figure 10 is recommended. In this manner, the carbide punch will benefit by the additional support given by the bushing.



Guide bushing for punch support.[5]

References

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2. "Diecarb—Grades, Application, Design and Maintenance", Tech. Data. 70-001, Firth Sterling Inc., Pittsburgh.
3. "Cemented or Sintered Carbides", L. J. Hull and D. L. Schwartz, Metals Handbook, 1948 ed., pp 59-63, Amer. Soc. for Metals, Cleveland, Ohio.
4. "Carbide Dies offer High Production Blanking and Piercing", A. E. Glen, Tooling and Production, June 1952.
5. "Carboloy Die Engineering Manual", D-24, Carboloy Co. Inc., Detroit, Mich.
6. "Carmet Catalog", Allegheny Ludlum Steel Corp., Carmet Division, Detroit, Mich.

AMERICAN MACHINE & FOUNDRY COMPANY has opened a Chicago branch office in which will be housed the sales offices for the Chicago area of several of the company's divisions and subsidiaries. These include: AMF Leland Electric Div.; AMF Lowerator; AMF Bakery Div.; Wahlstrom Lock Div.; AMF Pinspotters Inc.; DeWalt, Inc.; Cleveland Welding Co.; Sterling Engi- Inc.; Cleveland Welding O,W:COM-YANMP neering Co.; Union Machinery Co.; and Thompson-Bremer & Company Junior Toy Corporation an AMF subsidiary will retain its office in Chicago's Merchandise mart.

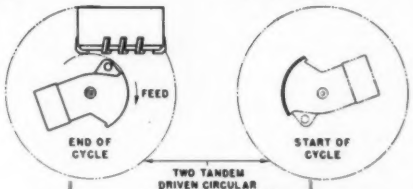
UNIQUE SET-UP

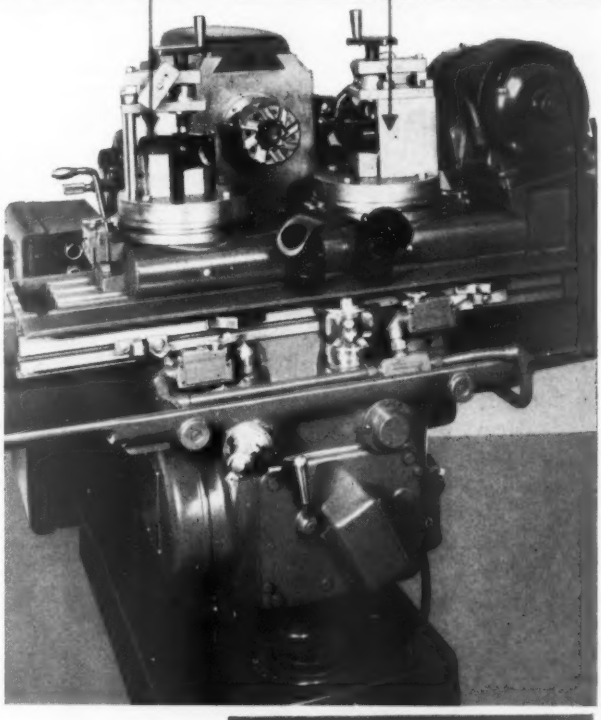
Automatically End-Mills Radius

. . . improves finish and production

PRODUCTION DATA:
Part name .... Fitting
Material ..... Cast Iron
Operation .... Mill 2¼" radius
Cutting speed . 395 feet/min.
Feed ..... 6¾ inches/min.
Depth of cut .. ⅛"
Cutter ..... 5" diameter, sintered carbide teeth
Production .... 51 per hour

Principle of operation. Heavy line indicates milled surface.





A high-quality finish on the radius end of cast iron fittings was a stumbling block to production until Cincinnati Application Engineers studied the job. Their analysis indicated that the work could be machined to advantage by the milling process, on a standard CINCINNATI No. 1-18 Plain Automatic equipped with two rotary attachments. ¶ The two attachments are arranged in tandem, driven from an electric motor through V-belts and a four-step pulley to give a selection of four rotary feed rates. The cycle is completely automatic, started with a single lever, milling one part while the other fixture is being loaded. Safety is engineered into the equipment through an ingenious arrangement of limit switches which engage a solenoid operated interference to the starting lever, preventing it from being accidentally moved while the cycle is progressing. Other limit switches retract the starting lever interference and stop the fixture motor after the cut has rotated through 180°. ¶ Both large and small shops can benefit from the low-cost production possibilities of CINCINNATI No. 1-18 Plain Automatics. Would you like to know more about these small low-cost producers of high-quality milling operations? Brief specifications will be found in Sweet's Machine Tool Catalog. For complete data, write for publication No. M-1555-2.

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CINCINNATI 9, OHIO

CINCINNATI No. 1-18 Plain Automatic Milling Machine. Complete specs. may be obtained by writing for catalog No. M-1555-2.

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Chip Disposal Unit Pays For Itself Within A Year

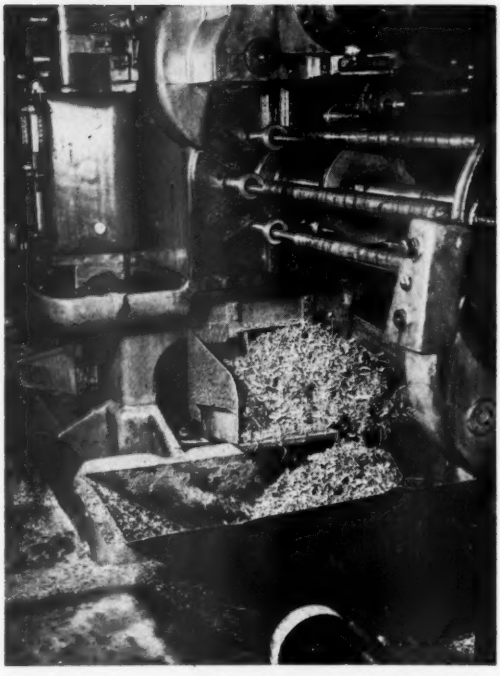
By crushing, then spinning its machine turnings in a central oil and chip disposal unit, Standard Pressed Steel Co. of Jenkintown, Pa. recovers up to 20% more cutting oil and gets up to four dollars more for each ton of scrap at the steel mills. The biggest saving, though, has been a reduction in scrap carloading time from six man-days to 60 man-minutes.

As a result, in processing an average 15 tons of machine scrap a day, the $40,000 unit has more than paid for itself in less than a year.

The chip disposal system is just one part of a company-wide expansion program that began three years ago. Since that time, SPS, world's largest producer of socket screws, has doubled its floor space to more than 650,000 square feet and added $10,000,000 in modern plant facilities. The company's main products are Unbrako socket screws, Flexloc self-locking nuts, Hallowell steel shop equipment, and aircraft specialty parts.

Heart of the new oil and scrap recovery system is a crusher and a centrifuge. The crusher — of the floating-ring type — pulverizes oily machine turnings to a coarse powder,

Chip trucks on the first floor are dumped by overhead hoist into the chip deck which feeds the crushing machine (extreme right). Chips similarly dumped on the floor above can be seen feeding into the chip deck through a vertical chute (left).



Oily chips are removed from under the cutters of this six-spindle automatic screw machine by conveyor belt and deposited in a waiting chip truck.

a form that permits handling by pneumatic conveyor and brings a premium price at the mills. The centrifuge wrings the pulverized chips dry of oil, recovering the maximum amount of oil possible (well above 90%, according to SPS estimates).

Previously, SPS had moved chips from the machines to a wooden storage bin outside the plant. From this bin, without further processing, the chips were dumped manually into freight cars. Aside from inefficient handling, this set-up proved to be troublesome from the housekeeping aspect. Oil that could have been reclaimed drained off this scrap heap into a nearby stream creating a pollution problem.

Now, all machine scrap is processed speedily and efficiently in the center of the plant right alongside the in-plant rail siding.

Turnings are picked up at the machine in three-wheel carts (chip trucks). Most SPS production machines are equipped with built-in belt conveyors that pick up the chips under the cutters and carry them out to the chip trucks parked alongside the machine.

The chip trucks are periodically made up into trains and towed by power truck to the central disposal unit. On the first floor of the plant, these carts are then dumped by

. . . *Continued on page 60*

at a lower piece cost with SPIRAL special cutting tools

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Tough cutting problems are simplified with Spiral special tools. The solution illustrated here is another example of how Spiral provides maximum tolerance control and longer tool life, while increasing production, with special tools fitted to the job.

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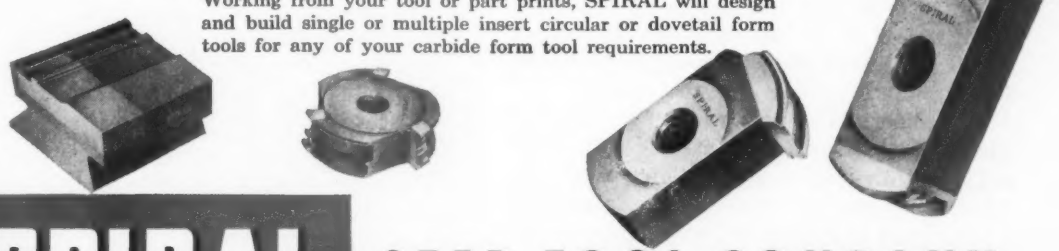

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. . . Chip Disposal, from page 58

overhead electric chain hoist into the chip deck that feeds the crusher. On the plant's second floor, the carts are dumped in the same fashion into a vertical chute that feeds down into the chip-deck. The crusher pulverizes the oil-laden chips — up to 50 tons a day — which are then blown overhead into an oily-chip hopper where some of the oil is

Used oil from the dirty-oil sump is processed in a sterilizer tank (background). Here sludge is allowed to settle out. The oil is next spun at 10,000 rpm in one of two centrifuge separators (foreground) to remove water and any remaining sediment.

allowed to drain off. Next, the chips are loaded into a steel basket and moved by electric overhead chain hoist to the centrifuge. Here, at a speed of 3600 rpm, most of the remaining oil is whirled out of the chips.

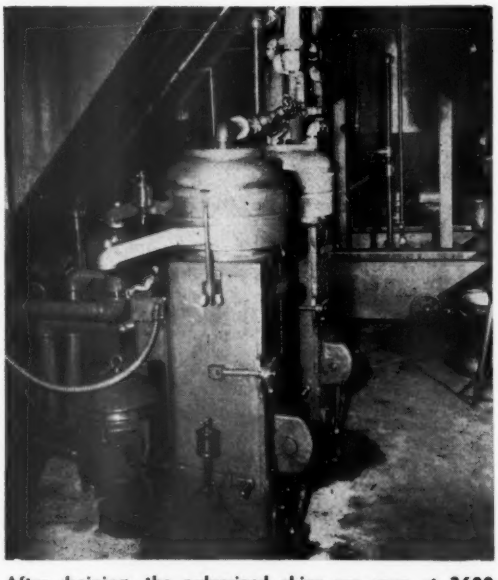
The dry chips are then removed from the centrifuge and dropped into a dry-chip hopper under the floor. From this point, chips are blown overhead to the car storage bin that sits over the in-plant rail siding. This hopper is capable of storing up to 80 tons of pulverized chips at one time, and can fill a gondola car in 20 to 60 minutes. It used to take SPS six man-days to do the same job. Dry chips in this pulverized state bring SPS up to four dollars more per ton at the steel mill.

The dirty oil from the centrifuge, plus other drippings collected at the chip deck and the oily-chip hopper, flows into the plant's underground dirty-oil tank. From here, it is pumped to a sterilizer, where in a thirty-minute process most of the sludge settles out. Next, the oil is spun in one of two high speed

Tons of processed chips pour into a waiting gondola from the car storage bin overhead. It used to take SPS six man-days to do the same job.

(10,000 rpm) centrifugal separators to remove any water and remaining contaminants. This cleaned oil is then returned to the plant's underground clean-oil storage tank for re-use.

SPS reprocesses about 2000 gallons of cutting oil a day in this fashion. With its new system, SPS figures that it recovers 15-20% more oil from its chips than would be possible by other methods.



After draining, the pulverized chips are spun at 3600 rpm in the centrifuge (left) to recover cutting oil that adhered to the machine turnings. They are then removed and dumped (as shown) into the dry-chip hopper under the floor.

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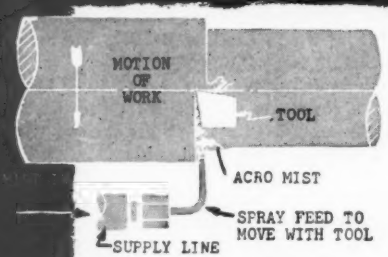

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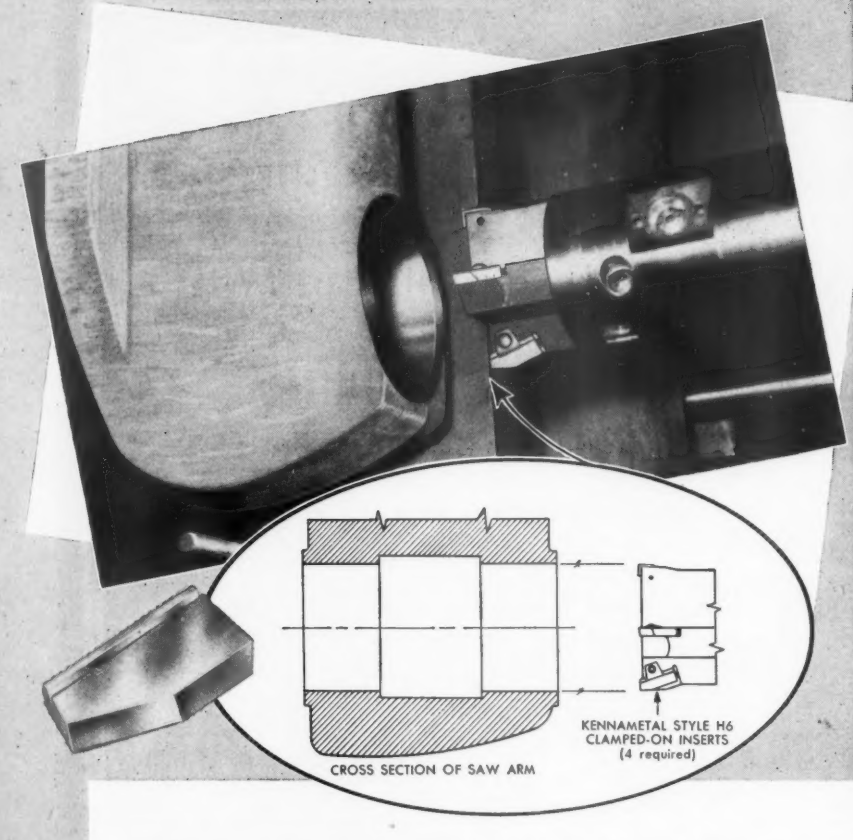
How to make A BORING JOB LESS BORING



Time, cost, and trouble were minimized in boring a 4.7″ diameter hole in cast iron saw arms by these tooling changes:

A standard tool Style C-12 was replaced by a special boring heading having four standard clamped-on Kennametal inserts Style H6, Grade K6. Speed was increased 20% and feed doubled. Boring time was reduced 60%.

Before any tool sharpening was needed about 250 pieces had been bored. After six regrinds the inserts were advanced, this procedure being repeated until half of their length was utilized. Stubs were salvaged for tips on brazed tools.

Total life per set of inserts was 12,500 pieces — unit tool cost only 1/5¢. Obviously the job was less troublesome.

Although your machining problem is different, it also might admit improvement by use of Kennametal tooling. Our Tool Engineers will be glad to help. Kennametal Inc., Latrobe, Pa.

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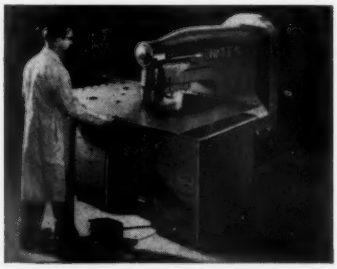
Heavy Duty Sheet Metal Fabricator

A new heavy-duty sheet metal fabricator, designed for punching, notching and nibbling, has just been announced by the manufacturer.



Photos courtesy Wales-Strippet Corporation

Fig. 1. The new 10-C sheet metal fabricator with a large work piece in position for punching. The large built-in table area supports the large work piece and eliminates buckling.

This new heavy-duty fabricator has a 27″ throat depth with a back gauge installed and a 30½″ throat depth without the back gauge. This deep throat press permits the punching of holes over a greater area in large work pieces.

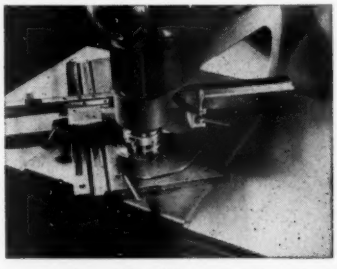


Fig. 2. The 45° right or left adjustment combines shaped hole positioning with positive back and side gauge alignment.

The punch assembly holder arm swings to the right for quick interchangeability of punches, reducing set-up time and increasing output of parts from hours to minutes and, in some cases, in seconds. The punches and dies are automatically aligned by this holder which permits holes to be punched up to 3½″ in diameter. With each punch, a set of dies is provided to meet the requirements of various types of metal and various thicknesses of stock.

. . . Continued on page 67

NEW!

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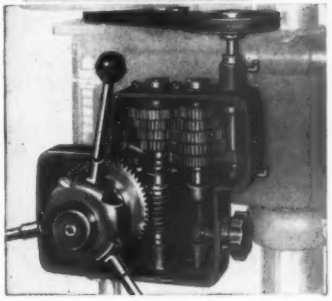
18" HEAVY-DUTY POWER FEED DRILL PRESS



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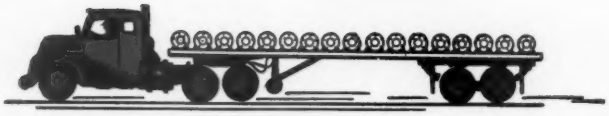

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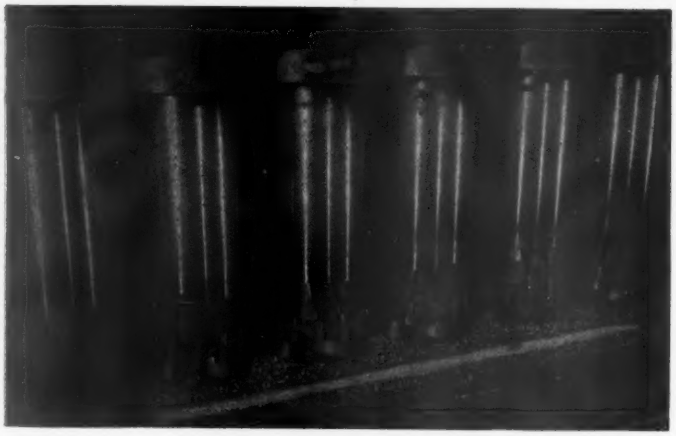

ACTUAL JOB

Farm Implement Mfg. Co.

Machine	Ingersoll Boring Mill—6 spindle
Part	Cylinder block
Operation	Rough cylinder bore
Tools	3 R.H. and 3 L.H. Wesson Fine Pitch Cutters—3.480 dia.— 12 Wessonmetal Solid GI Blades
Speed	148 S.F.M.
Stock Removel	3/16"
Feed	10" per min.—.063 per revolution
Length of Cut	8⅞"

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Cost of Tool	$49.68	Cost of Tool	$172.80
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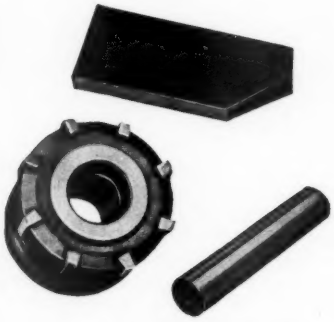

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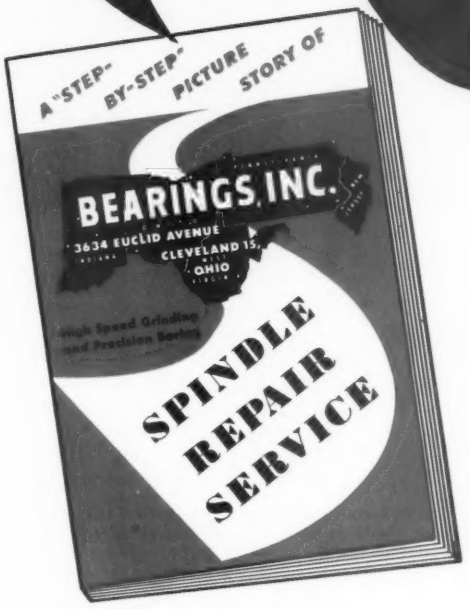

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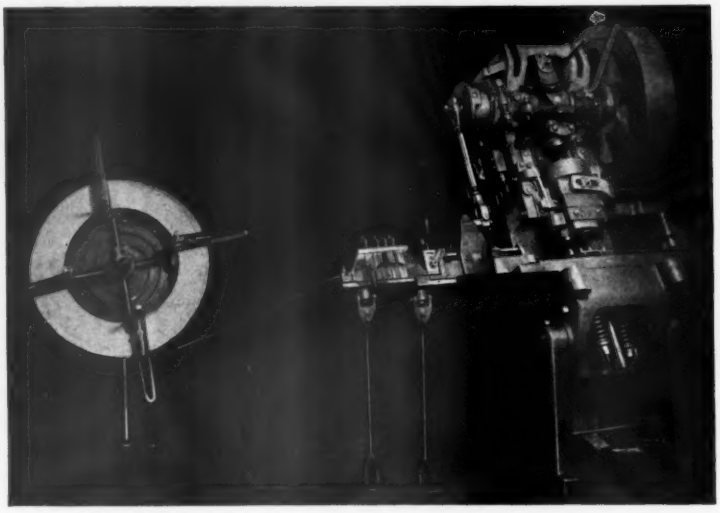
U.S. SLIDE FEEDS REDUCE COSTS



The photograph shows a conventional setup consisting of a U.S. Slide Feed and a U.S. Plain Straightener on a standard open-back inclinable press.

—even on low Production Runs!

METHOD OF FEEDING	TIME TO SETUP DIE	TIME TO SET FEED	TIME TO RUN 1000 PIECES	TOTAL TIME	TIME-SAVING EACH ADDT'L 1000 PIECES
HAND FEED	SAME FOR HAND OR AUTOMATIC FEEDING	NONE	30 MINUTES	30 MINUTES	
AUTOMATIC WITH U. S. SLIDE FEED	SAME FOR HAND OR AUTOMATIC FEEDING	20 MINUTES	10 MINUTES	30 MINUTES	20 MINUTES

The belief sometimes exists that long production runs are necessary for the economical use of automatic feeding equipment on punch presses. A New Jersey manufacturer of electrical devices has disproved this theory by the advantageous use of U.S. Slide Feeds where the required production is as low as 1000 pieces.

At this plant the same press and feed are used for producing a variety of parts. In changing from one part to another, they simply install the proper dies in the press, and reset the feed to provide the proper pitch or feed length.

Experiments have been made to determine the production quantity where automatic feeding becomes profitable. They have found this to be a production run of 1000 pieces. Their findings on a typical job are illustrated in the table above.

It will be noted that for any run in excess of 1000 pieces, substantial gains are made by using U.S. Slide Feeds. It should be pointed out that the jobs in question involve the use of progressive dies necessitating the maintenance of controlled accuracy of pitch. U.S. Slide feeds provide the required accuracy without the use of pilots or stops. In addition, the Slide Feed pulls the material through a U.S. Plain Straightener and maintains controlled accuracy.

Bulletin No. 80-T gives complete specifications for U.S. Slide Feeds and other units, such as Straighteners, Stock Reels, Coil Cradles, Scrap Choppers, Oilers and Wipers. Write for your copy — there's no obligation.

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U. S. Automatic Press Room Equipment—U. S. Die Sets and Accessories

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. . . Fabricator from page 62

Accurate gauging is provided by an easily adjusted back and side gauge with built-in scales which insure close tolerance.

This new machine is equipped with a large 56″ x 37″ work table which provides a level support for large workpieces and permits convenient left to right feeding and stacking with a minimum of motions for small workpieces.

Nibbling around guide plates

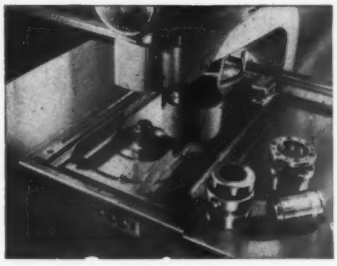

Fig. 3. Punch assembly holder arm swings right for quick interchangeability of punches. Note removed punch and stripping guide assembly at right on fabricator table. Die assembly is shown to the left of the punch with die button resting on die holder. Adapter sets permit use of punch and die sizes.

is practically an automatic operation on the fabricator by positioning the nibble lever, at the right side of the ram housing, to provide continuous operation of the ram.

One of its many outstanding features is the Hydra-New-Matic Head which operates with a minimum of vibration and noise at 165 strokes a minute. This head is revolutionary in its simplicity of design and operation.

Full-floating drive shaft construction places ram load, by means of main bearings, directly on the frame proper, eliminating all bending stress on drive shaft.

A drawer type cabinet on each side of the fabricator base holds punches and dies as well as providing for convenient storage. A built-in counter placed at eye level automatically totals strokes of ram. The non-repeat trip lever must be depressed for each cycle of the ram action. Full-swing electric light puts light where each job needs it most.

One-piece steel cast frame is scientifically designed to have maximum rigidity in all directions. The wide, unobstructed bed table is at the correct height

. . . Continued on page 68

At Portable Electric Tools, Inc., Chicago, costs went down 25% when this Delta air-powered hydraulic drill unit went into production on body housing of PET ¼″ portable electric drill.

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. . . Fabricator, from Page 67

for easy feeding of large sheets or for the operator to sit down while feeding small pieces.

Slug clearance hole in front of the frame directs slugs into an easily-emptied container.

The adjustable foot trip mechanism, which may be conveniently placed at any point within four feet from outlet in the base, permits the operator to use both hands in handling large sheets.

Toggle Clamps on Trunion Rotating Fixture

Federal Motor Truck Division of the Federal Fawick Corporation, Detroit, Michigan, use De-Sta-Co toggle clamps during the build-up operations on airplane towing tractors for the army. The tractors are used extensively at airports and are manufactured on a trunion rotating frame fixture which turns at 360° to permit easy access for the workmen.

Photo courtesy Detroit Stamping Company

The De-Sta-Co toggle clamps permit positive holding pressure of parts during the build-up operation. In the manufacturing of the tractors special holding blocks were welded to the adjusting bolt of the clamps to aid griping area on the channel iron. The heavy frame rails, welded brackets and channel iron are lowered into place on the fixture via an overhead crane, and clamped into position for the welding and riveting operations. The Model TT11 airplane towing tractor has a load capacity of 24 tons.

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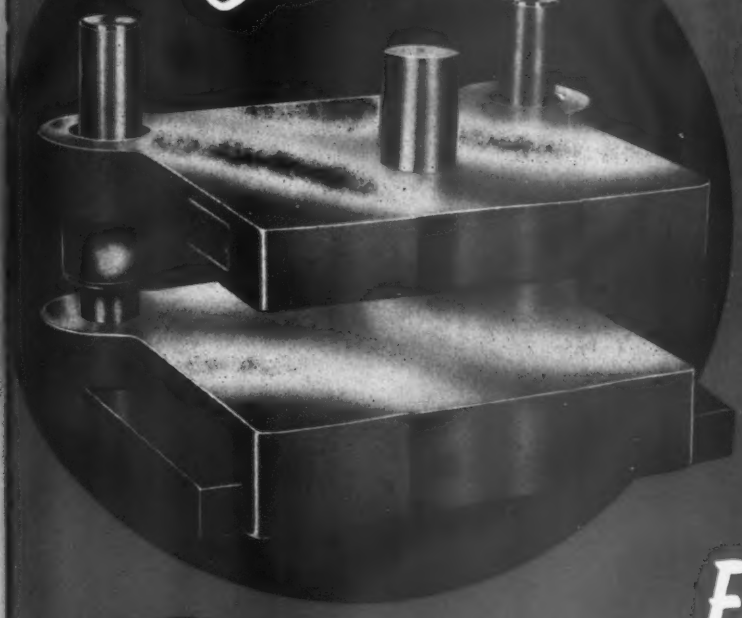

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protects fingers by providing roomy gripping space on either side of the die shoe. This flange may be mounted flush or on the edge of the die set and is welded in place. *There is no extra charge for this valuable safety feature.*

2 LOCK JAW LIFTING DEVICE

removes the danger of handling large die sets. Heavy steel components of this device are welded in place forming an integral part of the die set. They are positioned to insure proper balance when the set is lifted by either chain fall or crane.

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. . . Q. C. Talks, from page 29

from a contractor, he certifies that the equipment meets all contractual requirements. Naturally, then, a conscientious Inspector can be expected to question some of your procedures. He wants to assure himself that your procedures and control will provide the protection which the Government desires. And when occasionally you and the Inspector do not agree, don't take the attitude that since you have to live with the Inspector, you must acquiesce in every decision he makes. If you really believe that you are right and that he is wrong, and the facts support you, the Inspector's channels are open for the contractor's appeal. We are working hard to educate all Air Force Inspectors in the many new procedures which have been brought about by the use of 5923 in surveillance inspection.

Finally, we ask our contractors to be progressive in the use of modern techniques for the control of quality. Such a request is, of course, hardly necessary of any member of the American Society for Quality Control, since your very membership in this organization is indicative of your progressive, modern thinking. You realize, as we do, that the only way to get a quality product is to positively control those elements in manufacturing operations which will result in quality.

For many years Government contracts have contained a standard clause requiring the contractor to have a system of inspection acceptable to the Government. Until recent years, systems of inspection were the vogue. (I might add that the term "systems" has been rather loosely used). Quality Control is comparatively new, and we, by the use of this specification, have been attempting to elevate systems of inspection to modern Quality Control practices. The American Society of Quality Control, as champions of new and better means of controlling quality, is itself only seven years old. The Society in these few short years has made a major contribution to American Industry by fostering modern concepts and techniques of quality control, which have meant higher quality of materiel received by the Government, and as you exponents of Quality Control are aware, **at lower costs.**

In closing, I should just like to say that we feel that we too, through the medium of 5923, are establishing these very concepts and principles, advocated by the American Society for Quality Control. We shall make a continuing effort to keep pace with the progress made by the Society and by Industry in this very practical affair of Quality Control.

Practical Implications of the Air Force Quality Assurance Program

by

Lt. Col. O. C. Griffith

Chief, Operations Office
Quality Control
Headquarters, Air Materiel Command
Wright-Patterson Air Force Base, Ohio

Today, when every Government activity is being closely scrutinized, it is time for us to take an objective look at Specifi-

High production hits its peak when the "Touch of Gold" is added with Norton G Bond wheels for internal grinding.

cations MIL-Q-5923, to see whether or not it is worth while from the standpoints of all members of the Government-Industry team. We feel that the answer is yes. The operation of 5923 can and does help both Industry and the Air Force in achieving their common goal of assuring the highest quality at the lowest cost commensurate with this quality.

Specification MIL-Q-5923 or, more correctly, the quality control system which results from compliance with it, helps the Air Force in three ways. First of all, it provides a definitive basis on which Air Force inspection activities can be planned. These planned Air Force inspection activities are designated by the term "surveillance", about which I shall have more to say later. The important point here is that this surveillance is something quite different from a cursory spot check. It is objective; and, under optimum conditions, it is based on a calculated risk, inherent in any military operation. Also, it is to be noted that this surveillance type of inspection is the very antithesis of Government duplication of the contractor's inspection. It is well established that normally the Government must inspect material before it can be accepted. MIL-Q-5923 provides the means whereby this mandatory Government inspection may be reduced to a minimum — an objective minimum.

The Air Force benefits because 5923 provides the basis for obtaining better information on product quality than we ever had before. By this I mean that the contractor who is operating his Quality Control system in accordance with the requirements of 5923, will normally have pertinent information about the quality of his product, from the receipt of raw materials and purchased parts until the material is packed and shipped to the user. This information is, of course, available to the Air Force Inspector who accepts the product. Hence, the Inspector does not have to make his decision solely as a result of an inspection or a test of the end item, but rather, has at his disposal the significant quality history of the product. Even after acceptance, this quality information is of great value to the Air Force in connection with the investigation of defective equipment in service. Analysis of such information in the light of reported failure data, facilitates the contractor's correction of production processes, possible changes in design or improved quality control procedures, as the situation may dictate.

Most important of all, perhaps, is the fact that 5923 tends to make many manufacturers much more quality conscious; hence, the Air Force gets better quality equipment. We have found a great number of manufacturers, and very conscientious manufacturers at that, who had for years staked the quality of their products and their reputations on the skill of their workers. They had given practically no thought to a comprehensive inspection program, much less to an over-all program for the control of quality. Such companies, regardless of their integrity and their desire to do a good job, found themselves totally incapable of building military equipment to unfamiliar requirements during periods of national emergency.

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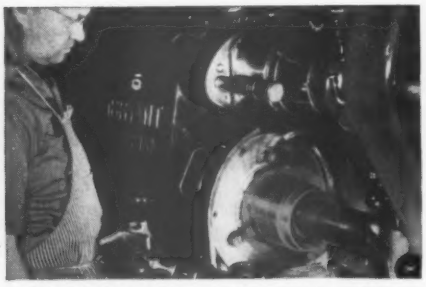

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Of more importance to Industry is the fact that 5923 helps you in at least four ways. First, it tells the contractor in advance what is required in the way of a quality control system. Prior to the issuance of 5923, all that the contractor knew was that he was required to have "an inspection system acceptable to the Government." (Often he knew that only if he had read the very fine print of the contract). Just what constituted an acceptable inspection system was left pretty much to agreement between the contractor and the local Government Inspector. It would serve no useful purpose to discuss all the controversies which might arise from such an indefinite contractual requirement. Now, however, with absolutely no intent to tell the contractor how to do his job, the Air Force does put him on notice concerning the general requirements with which his quality control system should comply.

Secondly, 5923 provides a plan for many companies which previously had little in the way of quality control. It is gratifying to note how many Air Force contractors have retained their quality control systems after their return to the production of civilian goods. Experiences of this sort confirm our contention that 5923 is suitable for a very wide range of industries and an equally wide variety of products.

Industry benefits because 5923 has had the effect of raising Quality Control to its merited organizational position in many companies. Prior to the performance of a contract with 5923, inspection or quality control in many companies was subordinated to production, engineering, or in some cases even to purchasing. As the contractor began to develop his quality control system, it became apparent to top management that the control of quality was, in fact, a management function. It is indeed gratifying to us, as I am sure it is to all Quality Control people, to note that among Air Force contractors today, Quality Control is commonly at the same organizational level as these other management functions.

Finally, Industry is helped because 5923 inevitably results in a closer inter-relationship and cooperation between quality control and engineering, production planning, manufacturing, tool engineering, customer relations and purchasing. Such requirements of 5923 as those for the control of engineering drawings and changes, the use of inspection instructions, the control of tools, gages and test equipment, receiving inspection, source inspection, and materials review, cannot be carried on by the Quality Control Department alone. Hence, 5923 fosters a close working relationship among these various departments, even though such cooperation might have been previously lacking. Such close cooperation, of course, inevitably results in a higher quality product.

Experience has demonstrated beyond any doubt that 5923 results in improved production and lower costs. The old complaint that inspection is simply an overhead cost which does nothing to help production is fast becoming invalid. There are at least four reasons for this.

First, Specification MIL-Q-5923 requires that the contractor take corrective action on repetitive

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discrepancies. Along the same line, it places a very definite premium on preventive Quality Control. The corrective action requirement comes into play primarily in connection with our materials review procedure. Under these procedures the taking of satisfactory corrective action to prevent recurrence of a discrepancy is a prerequisite to acceptance by the Air Force of material which, although perhaps not quite "up to snuff", is still satisfactory from an engineering point of view. With respect to preventive Quality Control, 5923 definitely recognizes the use of statistically sound process control procedure as a means of minimizing subsequent inspection operations.

Improved production and lower costs unquestionably result when the contractor has a planned program for controlling quality, as opposed to the unplanned "hit-or-miss" type of inspection found in many companies. Compliance with 5923 results in a planned program. In this connection, the requirement for written descriptions of the contractor's quality control procedures has frequently been criticized. However, it is difficult to imagine how any operation can be planned or executed without reducing to writing at least the essential elements. Many leading manufacturers have stated that they would write out all their procedures for shop use in great detail, whether or not they had any Government business. Specification MIL-Q-5923 does not ask for a great deal of detail in these procedures. All that we do ask is that the contractor provide a written description of the method by which he is complying with each of the very general requirements of 5923. Of course, it is essential that the AF Inspector who maintains surveillance over the contractor's quality control system should know what these procedures are. Written descriptions facilitate the job of the Inspector in planning and performing his surveillance functions.

I feel that you will agree that, at least in the long run, the requirement for inspection instructions will result in improvements in production and costs. Proper use of inspection instructions assures thorough coverage of the important characteristics of the item and encourages engineering analysis of the product from the viewpoint of quality. The Air Force does not insist on the preparation of complete classifications of defects. We do, however, want the contractor to issue written instructions, by any suitable means, to tell his inspectors **what** properties they are to inspect, **how many** to inspect and **what action** is to be taken as a result of the findings. This is considered essential to the Air Force program of surveillance inspection. At the same time, from the contractor's point of view, it should be recognized as a very effective management procedure.

Finally, the production improvements and the cost reductions, which can result from statistically valid process control information, are so well known to this group as to require no further discussion.

I wish to emphasize that we in the Air Force recognize and stress that the responsibility for producing a quality item rests with industry. The Air Force

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Quality Control program is based on the premise that the contractor has the responsibility for controlling the quality of his product and for presenting to the Air Force only material which conforms with the quality standards established by the contract. We require, through the terms of the contract, that the contractor have an acceptable quality control system. The job of Air Force Quality Control is to maintain surveillance over that system, thereby assuring itself of the acceptability of the product which the Air Force is buying.

Specification MIL-Q-5923 is not intended to infringe upon the contractor's fundamental responsibility, but rather to define it more clearly. This definition is the result of years of development by industry itself. The requirements of 5923 are general in nature. They deal with the essential elements of **any** quality control system.

The Air Force recognizes that industry must be free to use the methods and procedures best suited to its established practices and to the particular product, so long as the objectives of 5923 are met. I should like to paraphrase a few statements from the forthcoming AMC Manual on Quality Control which, as instructions to our Inspectors, reflect this policy.

1. While the Inspector has a legal right to be in a contractor's plant, he has a moral obligation to recognize at all times that the contractor is conducting business in the American way, which implies that within legal boundaries there is freedom from unnecessary Government restrictions. ***The Inspector should refrain from "telling" the contractor how to go about the business of correcting unsatisfactory conditions. ***He will bring to the attention of the responsible contractor personnel those conditions which are in need of corrective action and recommend that appropriate measures be taken. The theme is that the Inspector points out **what** is wrong, and the contractor determines **how** to correct it.

2. Specification MIL-Q-5923 contains **the general requirements** with which an acceptable Quality Control system should normally comply. ***The contractor is given wide latitude in devising the **procedures** which will be used to implement these requirements. The Inspector will request correction of those procedures which do not meet the objectives of the Air Force general requirements. ***It must be remembered, however, that there may be many equally satisfactory procedures, which will comply with any general requirement.

3. The quality control system should be planned and developed in conjunction with the contractor's other planning functions. *** It should also be based upon considerations of the complexity of product design, interchangeability and reliability requirements and manufacturing techniques. *** The guides discussed in this manual will have to be carefully considered in view of the nature, value and importance **common to the industry** and of the duration of the contract.

Underlying the entire Air Force Quality Assurance Program is the AF Quality Control policy. It is so fundamental to the surveillance concept that I should like to review it briefly.

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Air Force policy is that conformance of material to contractual requirements must be determined on the basis of objective quality evidence. If the contractor has an acceptable quality control system, he will furnish this evidence of quality to the Air Force Inspector, who will evaluate and verify it. This is the heart of the surveillance program. If the contractor does not furnish this evidence, the Inspector must gather it himself. That is, the AF Inspector must do what we consider to be the contractor's job of inspecting the material, to determine whether it is of acceptable quality. Naturally, this latter procedure would require many more Government

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Inspectors than would be needed simply to maintain surveillance over the contractor's system.

The Air Force Inspector must assure that the material he accepts meets all contractual requirements. On the other hand, he will not refuse to accept conforming material solely because the contractor's quality control system is deficient. If the deficiency in the contractor's system centers about his failure to furnish objective evidence of the quality of his product, acceptance may have to be delayed until the Inspector has obtained the necessary assurance of quality. In many cases this may require the assignment of additional Inspectors to the plant.

In closing, I think it appropriate to acknowledge publicly the contribution which the American Society for Quality Control, unwittingly perhaps, has made to the modernization and revitalization of the Air Force inspection organization. It was not until certain high Air Force officials recognized the power of the statistical approach and began to apply analytical techniques to Air Force inspection problems that the Air Force began to emerge from the dark ages of inspection. In the years since the war, our organization, our procedures, and our personnel policies have been completely revamped. Through a continuing series of refinements, we now have in effect Specification MIL-Q-5923B. While admittedly it is still not the ultimate and can still be improved upon, it has been amply demonstrated that operation of this specification can help both industry and the Government. It can result in improved production and lower costs. In short, it has met the acid test of any Air Force activity. It is giving this country "More Air Force Per Dollar."

Industrial News

The name of Taco-West Corporation of Chicago was recently changed to West Instrument Corporation. Since control instruments are the major portion of the company's business, it was decided that the word "Instrument" should be included in the name. The company's line of Gardsman control instruments include the On-Off Controller, High Limit, Proportioning, Three Position, Program, Portable Temperature and Stepless Controllers.

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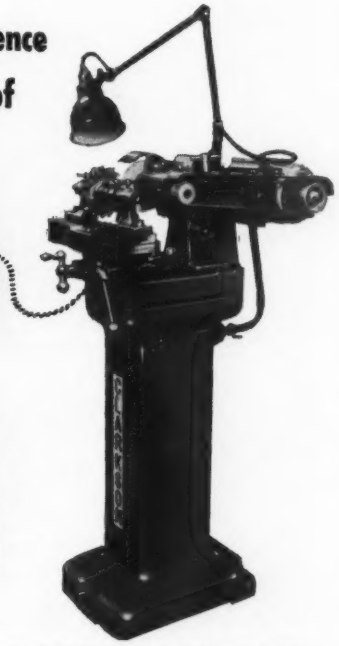

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SAE Forging Panel Reflects Industry Progress

One of the most fruitful panel discussions at the recent SAE National Production Forum was that on Forgings. Under the general chairmanship of Paul A. Miller, vice-president of The Leece-Neville Company, the 1953 Forum also included panels on Production Control, Grinding and Cutting Fluids, Progressive Assembly, Foundry Practice, Quality Control, Preventive Maintenance, and Material Handling.

No prepared papers were delivered on Forging, sessions being given over to discussion. The panel chairman was C. H. Smith, Jr., Steel Improvement & Forge Co.; secretary, Raymond Seabury, Drop Forging Assn.; and panel members, T. E. Darnton, General Motors, R. E. Hess, Transue and Williams Steel Forging Corp., F. A. Rood, General Motors, R. G. Friedman, National Machinery Co., and E. C. Clarke, Jr., Chambersburg Engineering Co.

In discussing the present and future of forging, the panel took note of a definite trend from hot to cold forgings. Many new and improved steels have helped to make this development possible. Improvements in die materials have permitted improvements in the process. Die life is increasingly better in cold forging.

In general, cold forging requires a machine at least five times as large as in hot forging. Although limitations of the process are largely unknown, present work is largely confined to 1" stock and the production of bolts, nuts, and similar products. Some work is being done on jet engine blades and on pinions.

Initial investment for cold forging machines is considerably more than for hot forging equipment. Production rates, however, are considerably increased; and, the process lends itself to automatic or semi-automatic operation. Where adaptable, therefore, the process seems to prove the worth of a higher capital investment.

Drop Hammers vs. Forging Presses

Apparently there is no sharp line of practical application between drop hammers and mechanical forging presses (such as made by National and Ajax). Any cost advantages of the press method are most noticeable where production quantities are high. Press forging is quite limited to relatively small forgings.

The Chambersburg Impactor was mentioned as presenting a new approach to material handling, although certain changes in design are required. The location of stock between the two moving dies remains a problem that has not been fully answered.

Constant redesign of the forging press points toward additional material and labor savings and increased production. A "tong feed" forging machine, which was reported to be in the development stage, will be automatic.

Automation

The panel felt that steps made in the application of automation and automatic controls in stock handling and heating operations had materially increased production. Apparently, an important limiting factor in handling hot metal from furnace to forging machine is the amount of scale. Various other conditions may affect success of mechanical contrivances. It was found that considerable time is required on each job to overcome these problems, thus limiting the success of automation according to the continuity of product and the length of production run.

Several large plants reported they had found statistical methods to be

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SAJO Millers are available in Plain and Universal types, with longitudinal power table feed only, or with power feed in all directions. Screws and dials are in the U. S. inch system.

★ Standard Equipment includes: 3 HP motor and starter equipment, motor driven coolant system, adjustable table feed nut to allow climb-milling, 1" arbor, arbor support brace.

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of extreme help in controlling weight, straightness, length, and heat-treat factors. Statistical control stations throughout the plant have helped materially to reduce scrap and lengthen die life. This discussion brought out the necessity for grading stock for varying tolerances (diameter and other attributes) before cutting. This measure, together with controlled lengths, helps ensure adequate die life and increased production.

Heating of Forgings

General opinion was that proper heating facilities have had considerable effect on scale reduction, although the panel believed that there is still room for important advances in this respect.

The pusher type and rotary type furnaces have come into more general use and appear to be very efficient for heating stock. It was reported that a 5-year study showed that use of a rotary furnace cost no more for operation than a box-type furnace, and gave better production. Comments indicated that rotary furnaces gave more volume, better fuel economy, more uniform heat, and increased die life. It was acknowledged that the box-type furnace is better and cheaper to operate for large, heavy work.

The question of pre-heating stock before bringing it up to forging heat drew the opinion that it should be discouraged unless required for specific metallurgical reasons.

High speed gas heat has been extremely helpful in increasing production on specific jobs, although not too practical for job-shop work.

There was evidence of induction heating being more widely used than ever before. The panel felt that this process, aided by automatic controls, is fast eliminating the problem of manual responsibility and is ensuring more accurate results. Mention was made of the easier training of operators, the cleaner shop resulting from less smoke and elimination, and increased die life (on upsetting jobs). The main objection to induction heating that was voiced was the higher initial or installed expense. In one particular instance reported, the cost quoted per pound for induction heating was twice that for oil heating.

Dies, Rolls, and Hammers

Rolls for pre-forming stock were reported to have been developed to save hammer or press operations. The shortage of skilled die sinkers has led to the use of multiple-spindle machines for sinking multiple dies. In answer to the question of differential cutter wear on multiple-spindles, the experience showed little difficulty provided die blocks are of uniform hardness.

Considerable discussion centered on the value of forging impressions into die blocks, or typing. The problem of shrinkage has been found to discourage use of this technique, although moderate success was reported with shallow impressions. Experimental work is being conducted on the casting of impressions, although the difficulty of holding tolerance is so far discouraging.

The Korfund type of spring suspension was offered as resulting in less vibration and maintenance on smaller hammers. All were of the opinion that some type of resilient material should be installed between the anvil and the foundation.

The Future

In summary, the panel and its audience felt that the future would bring the following: Development of automation for hot forging; further development of cold forging; expanded application for the "single blow upsetter"; better knowledge of plastic flow of materials; continued study of material changes under high velocity; and improved techniques of automatic handling of material.

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ASA Diamond Project

More effective use of industrial diamonds as a vital element in defense production is the objective of a new project to be started soon under the procedure of the American Standards Association.

This was announced by Vice Admiral G. F. Hussey, Jr., managing director of the ASA, following a general conference of interested groups which recommended the new standardization project. Tool engineers, the diamond trade, machine tool builders, industries using diamond tools, engineering societies, and Armed Forces, were represented.

The new project aims at interchangeability of diamond tools and their holders. The conference defined a "diamond tool" as the combination of a diamond and the "nib" or "shank" directly carrying it. A "holder" was defined as the fixture holding the diamond tool in the machine with which it is used.

"Such a large variety of diamond tools and holders have been developed over the years that there is no interchangeability between these parts", Admiral Hussey said. "The new ASA project is expected to remedy this situation and eliminate the present necessity of stocking a large number of different replacement parts.

"The scope of the work to be undertaken was tentatively defined to cover terminology and definitions applying to loose diamonds and diamond tools, and dimensions of diamond tools and tool holding accessories.

"Industrial diamonds play an important part in mass production, and their conservation is essential if industry is to continue without disruptive delays. They are used as cutting tools, for example, in turning and boring operations, and also in devices for truing and dressing abrasive wheels to restore their effective performance".

The American Society of Tool Engineers, which requested the ASA to consider the problem, offered to assume the administrative responsibility as sponsor for a project to be initiated under ASA procedure. The Industrial Diamond Association of America, trade association of the suppliers, agreed to join in this responsibility. The conference recommended that the two organizations be invited to accept joint sponsorship of the project and organize a technical committee to develop standards in this field.

Organizations represented at the General Conference were: American Society of Mechanical Engineers; American Society for Testing Materials; American Society of Tool Engineers; Automobile Manufacturers Association; Industrial Diamond Association of America; National Machine Tool Builders Association; U. S. Department of the Air Force.

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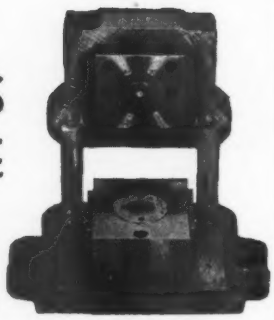

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Cooperative Education at Illinois Institute of Technology

Cooperative education — often overlooked by the high school graduate who thinks he can't afford to go to college—has been expanded at Illinois Institute of Technology.

Electrical engineering and industrial engineering have been added to I.I.T.'s co-op program, the educational plan which integrates classroom study with practical experience in industry. Previously the program was offered only in mechanical and metallurgical engineering.

Expansion of the cooperative program represents an opportunity for students to obtain an unparalleled college education, according to Philip B. Lottich, coordinator of the program at Illinois Tech.

The co-op program works like this: The student attends I.I.T. his first semester and takes a regular schedule of courses leading toward his degree. His next semester he takes no classes, but is employed full time by an industrial firm in work closely related to his field of study. He alternately attends school and works in industry until he has earned his degree.

During the semesters the student works, he not only receives valuable industrial experience but the company pays him a regular salary as well. With this he can pay his tuition and other expenses while he's going to school.

In some cases, the employing firm even pays the tuition. An example of this is the cooperative scholarship plan initiated this year by Armour Research Foundation, an affiliate of Illinois Tech.

Every semester the Foundation offers 20 co-op scholarships in mechanical and metallurgical engineering. These scholarships include full tuition, a monthly stipend of $90 for 12 months a year (this pay is gradually increased), work with some of the world's leading engineers and scientists, and a well-paid position upon graduation.

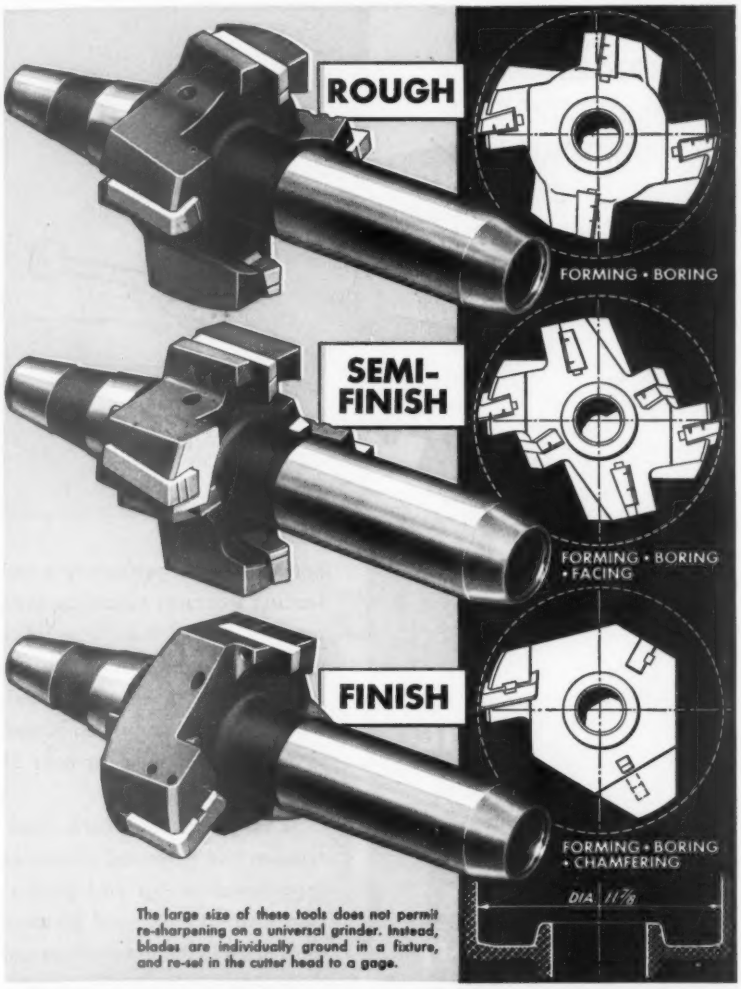
A co-op student can earn his degree in approximately 5½ years as compared to the normal four-year course. Co-op education, however, has many advantages over the ordinary college education. Coordinator Lottich lists the following as some of the major advantages:

1. Cooperative education gives the student practical experience to supplement his theoretical knowledge. He gains a background of know-how that cannot be classroom taught.

2. It acquaints him with job practices, skills, labor and plant operation before, rather than after, graduation. Many educators and employers rate this as a big asset to the graduate.

3. During the training period, industry has the opportunity to look over the student. The em-

. . . Continued on page 80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The large size of these tools does not permit re-sharpening on a universal grinder. Instead, blades are individually ground in a fixture, and re-set in the cutter head to a gage.

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. . . Education, from page 79

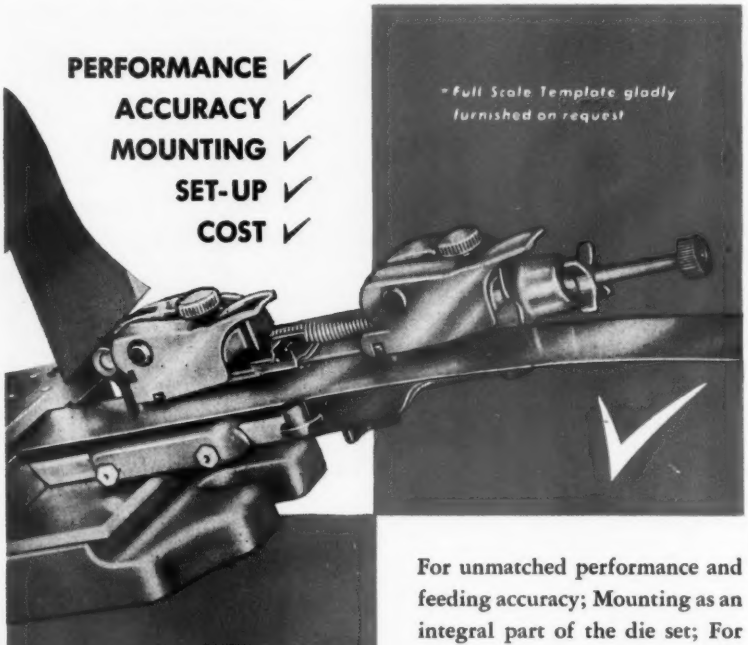
ployer may also help the student plan elective courses which will make him even more valuable after he graduates.

4. Co-op students work in some of the most modern, well-equipped laboratories in industry.

5. The co-op program makes a college education available to the many youths who cannot afford to attend college full-time.

6. Co-op graduates earn a higher salary than ordinary college graduates because of their experience in industry.

"In fact," said Coordinator Lottich, "about the only thing wrong with co-op education is that not enough potential college students know about it. Illinois Tech receives about twice as many requests for co-op students than it can fill each year. Cooperative education is the college bargain of the 20th century", he said, "and there just aren't enough students to meet the demand".



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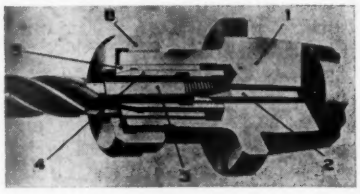
Self-Locking Chucks

Today's milling machine tool, designed to operate at feeds and speeds that would have been considered miraculous a decade ago, is capable of effecting tremendous increases in production. But the modern cutter can perform only within the limitations of its adaptor, and engineers have recently focused their attention on improvement of adaptor design. How well they have succeeded is demonstrated by two types of self-locking chucks recently introduced to the American market from Britain. These unique tools—known as the Autolock and the Dedlock—are outstanding exam-



ples of British engineering skill, and provide what is perhaps the most efficient means yet devised for marrying the cutter to a milling machine.

The Autolock Chuck, which entirely eliminates the use of adaptors throughout the range of its two capacities (1/16″ to ¾″ and ⅞″ to 1¾″), and its big brother the Dedlock Chuck which handles cutters from 2″ to 6″, are made by a long established firm of precision manufacturers, Clarkson (Engineers) Limited of Nuneaton, England. Both types of chucks are accompanied by a wide range of Clarkson cutters.

The Autolock Chuck consists of the following parts, as numbered in the illustration.

1. The arbor or main body of the chuck which is made with a taper to fit any machine.
2. The male center, which keeps the cutter centered and insures rigidity.
3. Cutter.
4. The collet. This part has two dogs which fit into the neck of the chuck body, to prevent the collet from turning.
5. The sleeve. This houses the collet and has a tapered por-

. . . Continued on page 98

DEVELOPING COOPERATION IN SELECTING MATERIALS

by Theodore A. Jagen,
Senior Engineer,
Mechanical Development Group
Hyatt Bearing Division
General Motor Corporation
Harrison N. J.

Cooperation in the selection of materials can be achieved through proper organization with strong management support.

I am going to tell you how we approach this problem at the Hyatt Bearings Division of General Motors.

First of all, let me say that roller bearings are a highly developed product. At Hyatt, we carry on a continuing development program, not only on the method of manufacturing bearings, but on the material which goes into them as well.

90% of the material used to manufacture bearings is steel. Through the years, the metallurgy of the steel for various applications has been generally established and we know how it will perform. Our main problem in the selection of material is in the form in which the steel is procured.

No one person can excel in product design, manufacturing, cost analysis, and material procurement, all of which contribute to the proper selection of materials. It requires teamwork to coordinate the efforts of a group of specialists in order to get the most out of materials.

Our material selection problem can be divided into two parts—first, selecting material for new bearings and, second, improving and reducing the cost of materials in our regular product. Cooperation is the keynote for solving both these problems.

The selection of materials for new bearings is in the hands of our product engineering group. However, before a new bearing is released for production, an authorization request is circulated among all interested department heads so that they have an opportunity to comment on the material as well as on the tooling and equipment required to manufacture the part.

It is in the area of improving and reducing the cost of materials on existing bearings that our main efforts are concentrated and, in order to coordinate the proper selection of materials at Hyatt, a Material Utilization Committee has been functioning for many years. This committee consists of department heads from product engineering, metallurgical, process development, manufacturing, purchasing, and accounting and has as its chairman a member of top management.

The committee meets periodically and discusses all material developments. It acts as a sounding board of all the in-

. . . *Continued on page 94*

This article by Mr. Jagen was first presented as an address delivered at the first Basic Materials Conference, New York, June 1953.

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. . . Jet Engine, from page 52

per set-up, due to either broach or tooling failure. Today, it is not uncommon to make runs of 8,000 blades per set-up.

Much of this improvement is due to better hardness control, which eliminated the hard blades that usually caused damage to the broaching cutters. It also took a considerable amount of engineering to spread out the chip load per tooth to produce satisfactory tool life and finish.

Although greatly reduced, the amount of handwork applied in finishing these blades is still a fertile field for good tool engineering. For instance, we have a machine that not only eliminated the handwork of radiusing the edges, but does it better and faster.

Barrel finishing is also extensively used to remove the sharp corners and edges and to improve the surface finish of the blade itself.

At the final inspection, the slow manual-type of magnetic-particle inspection has been replaced by an automatic machine which has one operator and six inspectors. The operator loads the blades onto a conveyor where they are magnetized in the longitudinal direction and sprayed with oil and iron filings. Inspectors remove the blades, circle any defects with red pencil and put defective blades in tote boxes. Satisfactory blades are placed on another conveyor by the inspectors, are magnetized in the transverse direction and sprayed again. Questionable blades are again removed and marked and satisfactory blades are placed on a belt which carries them through a demagnetizer and dumps them in a tote box on the end of the machine.

When we started, we could not control the size of the dovetail in the wheel nor the blade; therefore, all the blades had their dovetails tailor fitted to their respective dovetail slots. Today, we have overcome that deficiency and can grind thousands of blades to the same size, using a two-wheel Blanchard grinder with special fixturing (Fig. 12).

With the size of the wheel and blade ring dovetails and that of the blades controlled, automatic inserting machines (Fig. 13) can assemble the blades, saving hours of hand work.

I have talked about the manufacturing methods and tooling of only two parts of the General Electric gas turbine. It is probable that, by the time this article is read, various improvements in manufacturing techniques will already have been initiated. There are many other parts such as the accessory gears, the intricate gear casing, the welded sheet metal parts, and the assembly and test — each one with interesting tooling and manufacturing problems for tool engineers to solve — a job that makes tool engineering alive and exciting.

Figure 12

Figure 13

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Thread Inserts Solve Disassembly Problems

Proper maintenance of a jet engine requires frequent disassembly and reassembly of certain components. This poses a design problem, as aluminum and magnesium are used extensively in aircraft engines, the threads tapped in these metals are not noted for durability or long life.

One solution of this maintenance problem is the use of stainless steel wire inserts. These wire thread inserts provide higher loading strengths in all materials and are more resistant to wear, vibration, seizing, galling, and corrosion than original threads.

While a total of more than 75 inserts is applied in one jet engine, a specific example will serve to illustrate the benefits achieved. The air inlet screens at the front of the engine pivot on shafts which revolve in spherical bearing pillow blocks supplied by The Heim Company, of Fairfield, Conn. In Figure 1 is shown one of these pillow blocks along with a wire thread insert. The tapped hole at the top of the bearing has already been protected with a ¼-28 insert, ⅜ in. long.

Photos courtesy Heli-Coil Corporation

Fig. 1. Stainless steel wire thread insert fits into tapped hole in the bearing housing. The hole at the top of the housing has already been protected with an insert.

Sound logic dictated this use of inserts. Engine design limited the size of bearing that could be applied in this area (Figure 2). Unfortunately, this size would not allow sufficient thread engagement for secure retention of the cap screws. However, the higher loading strength made possible by greater flank engagement permitted by the insert solved this problem. The insert - protected holes in the pillow blocks proved able to withstand frequent disassembly as well as resist vibrations and stresses imposed in flight.

A bonus feature in the use of this component is ease of installation. The inserts are formed of stainless steel wire having a diamond shaped cross section. Each

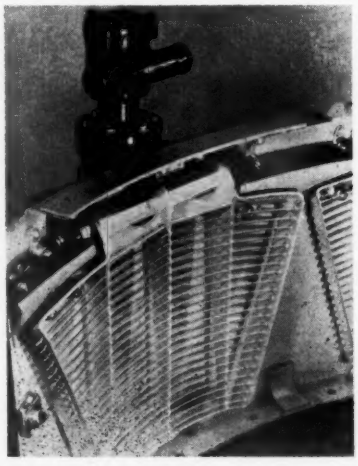

Fig. 2. This air inlet screen on a jet engine pivots on a shaft which revolves in ball bearing pillow blocks.

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insert is precisely coiled to an outside diameter slightly larger than the major diameter of the tapped hole.

As the insert is screwed into the hole, the action of the inserting tool slightly reduces the free diameter of the coil. This reduction in diameter seats the insert under spring compression so that it cannot shift after installation. Flexibility of the coiled wire insert allows more equal distribution of the load over each thread rather than over just a few threads, thus achieving greater load-bearing qualities.

Conventional Crowning Added To Shaving Machine

Gear tooth crowning by the conventional method of rocking the machine table during the shaving cycle is a feature that has just been added to the Red Ring Model GCU shaving machine by a new redesign.

Heretofore, crowning on this machine required a specially formed cutter, but now it can be done with any standard rotary cutter while the work gear is being reciprocated in line with its axis.

The rocking action of the table is accomplished by means of a central pivot and a cam which causes each end of the table to rise slightly as the end of the cutting stroke is approached.

The table has also been made considerably more rigid and the crowning cam located on table centerline to avoid any twist.

The point of maximum crown, although usually at the center of the tooth may be shifted either way by changing the position of the work gear with reference to that of the cutter. The amount of crown is a function of the cam adjustment.

. . . *Continued on page 82.4*

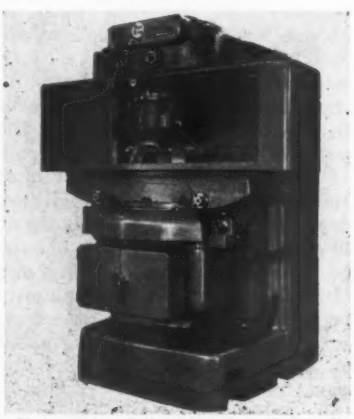

Photo courtesy National Broach & Machine Co.

Fig. 1 Red Ring Gear Shaving Machine, Model GCU equipped for gear tooth crowning and differential automatic upfeed.

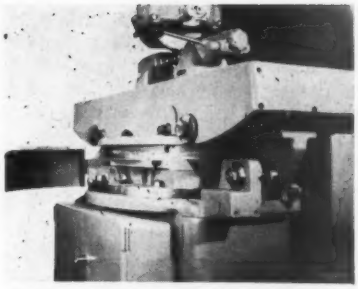

Fig. 2 Crowning cam on a Red Ring Gear Shaving Machine is shown in right foreground.

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. . .Crownings, from page 82.3

When it is desired to shave gear teeth, spur or helical without a crown, the crowning cam is disengaged. The table then remains horizontal throughout its stroke.

The pivoted table also offers the possibility of shaving gear teeth to a predetermined taper. In this case the table is set at the desired angle and locked. Shaving then proceeds on the conventional cycle.

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As optional equipment the recently announced differential upfeed mechanism may be incorporated with this machine. This provides automatic precision up-feed in selected increments throughout the shaving cycle and automatic return to proper backlash position at the end of the cycle. Any number of cutting strokes may be used, each with its own increment of feed and any number of idling strokes, all automatically controlled.

"Soft" Metal Parts Deburred Rapidly by Maizo Blast Machines

Photo courtesy Modern Industrial Engineering Co.

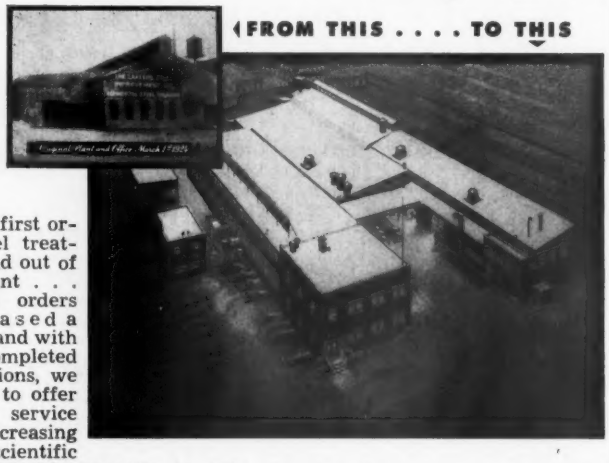
Shown above are the two standard Maizo Blast machines used for the rapid deburring of "soft" metal parts. Model MA-24 (at left) has a ferris-wheel type fixture for continuous blasting of small parts. Larger work is handled in Model MA-1 (at right) with the work rotating in a fixture on a fixed axis. It can be supplied with 2, 4 or 6 blasting guns depending on the nature of the work handled.

Fast production deburring of "soft" metal parts using either a continuous rotating process for small parts or a stationary clamping arrangement for larger units, is possible with the two standard Maizo Blast machines. Both standard machine types are designed to remove light burrs from metals in the range of aluminum to mild steel. In both models, maize, or a similar "soft" material, is blasted against the parts under factory airline pressure. These machines are specially suitable to deburring parts that would be damaged by tumbling.

A ferris-wheel type fixture rotates continuously between two reciprocating blasting guns in Model MA-24 at the rate of approximately one revolution every five minutes. The revolving wheel carries 16 to 24 pieces in holding wires bent to suit the part and yields a production rate of 192 to 288 pieces per hour at 100 percent efficiency. Higher production rates can be obtained, depending on the size of the part. A friction-driven slip clutch permits the operator to retard rotation if necessary. Speed of rotation can be varied as required by hardness of the parts being blasted by changing the drive pulley. Automatic transmission and aircraft parts are typical of those ideally suited to the continuously operating unit.

...there is a Reason!.... When You Grow

FROM THIS . . . . TO THIS



1924 saw the first orders for steel treating roll in and out of our first plant . . . Today those orders have increased a hundredfold and with recently completed plant expansions, we will be able to offer even better service on an ever increasing number of scientific steel improvement processes to our customers.

Thanks to our customers, Lakeside has grown to be the largest, most versatile steel treating plant in this area. To insure your continued confidence, we are determined to keep pace with metallurgical progress *in the future* as we have *in the past.*

Our Services: Electronic Induction Hardening, Carbonitriding, Flame Hardening, Heat Treating, Bar Stock Treating and Straightening (mill lengths and sizes), Annealing, Stress Relieving, Normalizing, Pack, Gas or Liquid Carburizing, Nitriding, Speed Nitriding, Aerocasing, Chapmanizing, Cyaniding, Sand Blasting, Laboratory Research and Physical Testing.

THE Lakeside Steel Improvement Co.

3418 LAKESIDE AVE., CLEVELAND 14, OHIO HENDERSON 1-9100

A ½ hp motor belt-connected to a 3,000 to 1 speed reducer drives the ferris-wheel. The reciprocating and oscillating blasting arms holding the guns are driven through a crank from a second speed reduction drive that has its own ½ hp motor. Housing is box-edge welded sheet steel. An access door is provided with a window for observation of parts during blasting operation. Normal plant air is all that is required for the machine, which operates at 60 to 80 pounds per square inch. The blasting material is reused constantly in the closed system. It falls into a funnel after blasting, is picked up by the airstream and recirculated. There is a slight loss of blasting material, of course, in the form of dust resulting from the blasting operation. This requires connecting the unit to a ventilating system.

Larger parts not suitable to the continuous machine can be handled in Model MA-1, a stationary unit in which parts rotate on a fixed axis in a fixture. Typical parts handled in Model MA-1 are impeller housings, rotors, etc. Since the angle at which the blasting guns are set depends on the nature of the part in process, the guns are adjustable and machines can be supplied with 2, 4 or 6 guns. A single ½ hp motor and speed reducer supply power for the unit.

Carbide Masonry Drill Sharpening Technique

Four steps to sharpening carbide tipped masonry drills have been outlined by the Carboloy Department of General Electric Company in Detroit.

The Department recommends using a silicon carbide wheel (C100-18V or C80-18V), for use in resharpening the drills and restoring the original 118° included angle. The drills should be sharpened when a 1/64" or more flat develops on the cutting edge. The steps:

. . . Continued on page 82.6

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that you've READ ABOUT! HEARD ABOUT—

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. . . Carbide Drill, from page 82.5

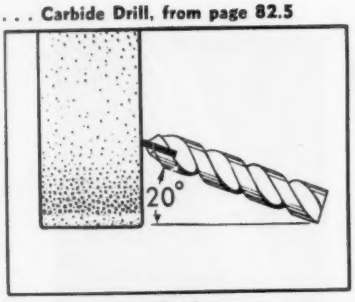

FIG. 1

1. Bring the drill against the side of the grinding wheel at a 20° angle as shown in Figure 1. This 20° angle should be maintained, otherwise the drill will not cut properly.

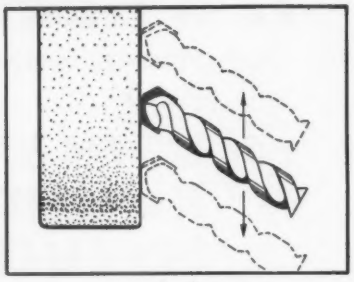

FIG. 2

2. Using moderate pressure, move the drill back and forth across the wheel to avoid overheating (Figure 2). (If overheating should occur, do not drop the drill into liquids to cool.)

3. Keep the two cutting edges of the drill of equal length while sharpening (Figure 3). If one edge varies in size, the drill will make oversized cuts.

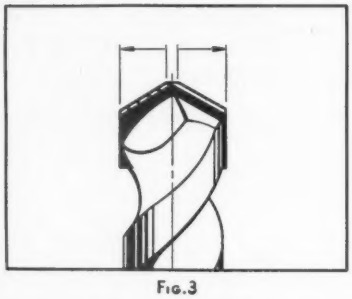

FIG. 3

4. Repeated resharpening of the drill will reduce the clearance between the carbide tip and the steel shank. When necessary, grind away the steel from behind the carbide tip so that the steel is nowhere closer than 1/32" to the working surface of the carbide blank. (Figure 4).

The Carboloy Department suggests that the drills can be sharpened on either a pedestal or bench type grinder. If the drill must be sharpened while on the job, a portable drill can be mounted on a stand and a small silicon carbide wheel used.

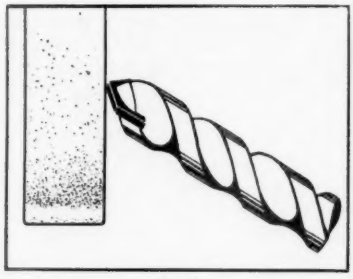

FIG. 4

The new Carboloy masonry drill is being used extensively in all types of masonry products, including brick, plaster, concrete, etc.

Human Relations in Small Industry

The importance of human relations in operating a small business is explained in a new booklet issued by the Small Defense Plants Administration, according to Acting SDPA Administrator Y. Brynildssen.

The booklet, "Human Relations in Small Industry", is being sold for 25 cents per copy by the U. S. Government Printing Office, Washington 25, D. C.

"This publication", Mr. Brynildssen said, "was issued by SDPA to give operating managers of small manufacturing plants a summary — illustrated with actual examples — of useful principles of human relations, together with some guides for applying them.

Today successful management demands a new skill—the ability to work with employees as a team.

It is pointed out that "The task of management today has become that of giving leadership and direction to groups of people. This holds true not only of top management, but of all levels of supervision. While the hard-fisted, tough-talking foreman of a few years ago supervised each man individually, the modern foreman is coordinator of a group. To be an effective group leader, he must forego constant supervision of his men.

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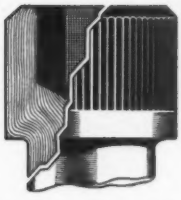

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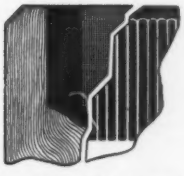

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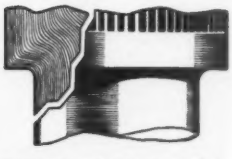

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If you did, and it's an UNBRAKO, you'd marvel at the knurled head, the uniform hex socket, the smooth shank, the precision threads, all combined to make a strong, close tolerance fastener.

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SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

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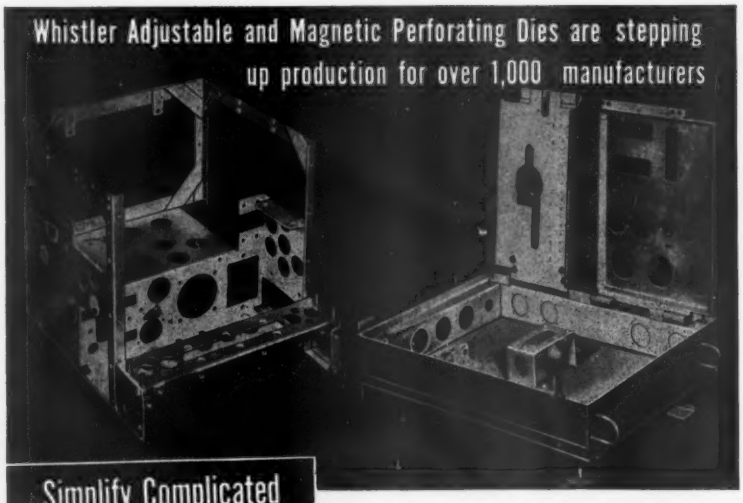
PUBLICATION

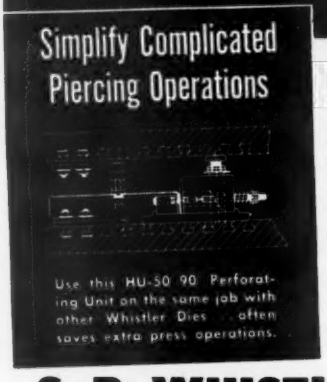
High Speed Steel and Carbide Tools produced by M. A. Ford. Mfg. Co., Inc., 732 W. River St., are on display in the firm's latest brochure, an 8-page illustrated booklet. This pamphlet offers such information as recommended operation speeds, grades for cutting and fluting and specifications of Ford products.

Circle Inform-A-Gram No. B1.

Plastic Gage Handles One Third Lighter than aluminum, tough, long-lasting and that will not chip or mar are described in literature now available from Federal Tool Corp., 3603 W. Pratt Blvd., Chicago 45, Ill. Possess good insulating qualities and come in four colors for ready identification.

Circle Inform-A-Gram No. B2.

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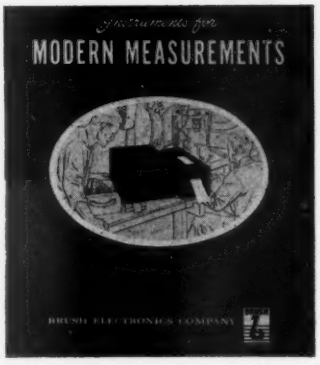
For your convenience, Whistler direct factory representatives are located in most principal cities. Their on-the-job application experience, combined with Whistler's 35 years experience in the manufacture of tools and dies, is available on request.

Booth 2024—National Metal Congress—Oct. 19 to 23, Cleveland

"Instruments for Modern Measurements" is the title of a new 34-page illustrated booklet published by Brush Electronics Co., 3405 Perkins Ave., Cleveland 14, Ohio. It describes in concise detail over 37 different in-



struments especially engineered and produced for electrical measurements, textile measurements, ultrasonic energy applications and electro-acoustical measurements. Several new instruments are included as well as improved models.

Circle Inform-A-Gram No. B3.

Short Run Horning and flange notching problems solved with Leslie model "A" hand punch press. All data from Leslie Welding Co., 2937 Carroll Ave., Chicago 12, Ill.

Circle Inform-A-Gram No. B4.

Ideal For Small Milling Machines, the L-W #SD 6½" swing dividing head has low first cost and combines accuracy, ruggedness, and quality. Full data on this and other machine tool attachments is available from L-W Chuck Co., 72 S. St. Clair St., Toledo 4, Ohio.

Circle Inform-A-Gram No. B5.

"Moto-Tools" provide Pocket Machine Shop, are unexcelled for such work as marking parts, grinding dies, sharpening machine tools, and deburring machine tool. Full data from Dremel Mfg. Co., 2420-18th St., Racine, Wisconsin.

Circle Inform-A-Gram No. B6.

All Hardinge Precision Production and Tool Room Machines feature preloaded ball bearing spindle construction for high speeds. Literature on the firm's chucking, threading and second operation lathes and universal and plain milling machines is available by writing to Hardinge Bros., Inc., Elmira, N.Y.

Circle Inform-A-Gram No. B7.

PREVIEWS

Circle postage-free Inform-A-Gram Key Number for your request

Use of Adhesives, Sealers and Coatings by the automotive industry are described in a new 12-page illustrated brochure available from Minnesota Mining & Mfg. Co., 423 Piquette Ave., Detroit 2, Mich. Included are specific recommendations for each type of application.
Circle Inform-A-Gram No. B8.

How the Centralized Accumeter System takes the time and trouble out of Yak steering assembly lubrication is explained in full in new bulletin issued by Mercury Mfg. Co., 4044 S. Halsted St., Chicago 9, Ill. Photographs show the simplicity of the new lubrication method.
Circle Inform-A-Gram No. B9.

Punch Press Stop by the Brinnel Co., Simsbury, Conn., has electrical and mechanical operation combined, gives many plus safety and efficiency features. Universally adaptable to punch presses with mechanical clutches. Literature now available.
Circle Inform-A-Gram No. B10.

Standard Optical Comparator Charts that are available for any make and model of projector are subject of new catalog from Gage Co., Battle Creek, Michigan. Thread form and inspection charts, radius and angular layouts.
Circle Inform-A-Gram No. B11.

Adjustable Two Spindle Drilling Heads drill two holes at a time, feature variable drilling center adjustments by loosening two hex nuts. Full data Linderme Engineering & Sales, 8132 Puritan, Detroit 21, Michigan.
Circle Inform-A-Gram No. B12.

Black Granite Surface Plates by Collins Black Granite Surface Plate Co., 2326 E. Eighth, Los Angeles, Calif., are described in current literature. Finished to 50 millionths, impervious to fluid contamination and deterioration.
Circle Inform-A-Gram No. B13.

L & J Presses are Precision Engineered for dependable service with minimum maintenance. 12 OBI models, back geared and plain flywheel types, 8 sizes from 6 to 80 ton capacity. Data — L. & J. Press Corp., 1626 Sterling Ave., Elkhart, Indiana.
Circle Inform-A-Gram No. B14.

The New Waldes Truarc E-Ring Dispenser makes possible faster, more efficient handling and applying of Waldes Truarc E-Rings to lock slots and grooves on a mass production basis. How it operates is ably explained in a brochure available from Waldes Kohinoor, Inc., Long Island City 1, N. Y.
Circle Inform-A-Gram No. B15.

Users of Rotary Stock Stops, floating holders, tap holders and hinged shoe bushing blanks will want the Barnaby catalog illustrating this company's complete line. Specifications, sizes and prices are tabulated. Tools are properly illustrated. Write to Barnaby Mfg. Co., Inc., 74 Knowlton St., Bridgeport 8, Conn.
Circle Inform-A-Gram No. B16.

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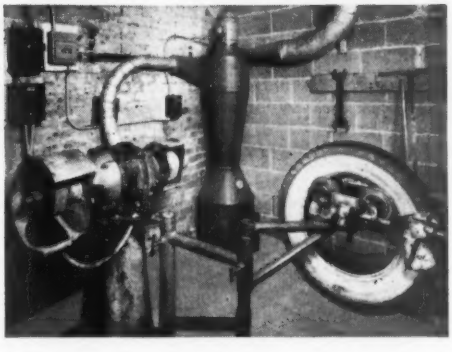

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Pecos Pete, legendary cowboy, tamed cyclones for sport. Torit makes them useful.

The ability of a cyclone type Torit Dust Separator to handle large volume is well illustrated above. This model 18-FM unit is making a clean job of getting rubber and fabric dusts from a tire buffing wheel.

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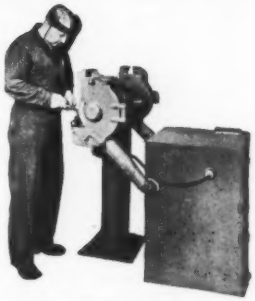

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Just One Set-Up for Both Rough and Finish Grinding is possible with the Wolters carbide tool grinder. This machine has two wheels mounted concentrically. Optical mike is built in. Full data from Cosa Corp., 405 Lexington Ave., New York 17, N.Y.
Circle Inform-A-Gram No. B18.

Solid Carbide End Mills are treated in catalog 12 from Raymac Mfg. Co., 3729 Cass Ave., Detroit, Michigan. Also featured are solid carbide centerlaps, with constant maintenance of correct angle.
Circle Inform-A-Gram No. B19.

Pope Heavy Duty Wheel - Head Spindles are designed for a wide variety of application such as grinding, boring, milling, drilling and many other operations requiring precision combined with ruggedness in the spindles. Further information on these products can be obtained by writing to Pope Machine Corp., 261 River St., Haverhill, Mass.
Circle Inform-A-Gram No. B20.

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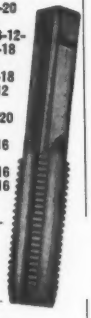
9	24-28-32-40
10	28-30-36-40-48-64
12	20-28-32-36
14	20-24-28
1/16	60-64
5/64	72
3/32	48
7/64	48-56
1/8	32-40
5/32	32-36-40
9/64	36-40
11/64	36
3/16	20-24-32
13/64	32
7/32	24-28-32
1/4	18-24-26-27-30-32-36-40
5/16	16-20-22-27-28-32-40
3/8	12-16-18-20-27-28-32-36-40-48
7/16	12-16-18-22-24-27-28-30-32-36-40
1/2	12-14-16-18-22-24-26-27-28-30-32-40
9/16	16-20-24-27-28-30-32-40-48
5/8	12-14-16-20-24-27-28-32-36-40
11/16	11-16-18-20-24-27-28-30-32
3/4	9-11-12-14-18-20-24-26-27-28-32
13/16	10-14-18-20-32
7/8	10-12-16-18-20-24-27-28-32
15/16	8-9-10-12-14-16-18-20-24-32
1	10-12-16-18-20-24-27-32-40
1-1/16	12-14-16-18-20-24
1-1/8	8-10-14-16-18-20-24-32
1-3/16	8-10-12-14-16-18-20-24
1-1/4	8-10-14-16-18-20-24-32
1-5/16	12-14-16-18-20-24-32
1-3/8	8-10-14-16-18-20-24
1-7/16	8-10-12-16-18-20-24
1-1/2	8-10-14-16-18-20-24-28
1-9/16	18-20-24
1-5/8	5½-8-10-12-13-16-18-20-24
1-11/16	10-12-14-16-18-20-24
1-3/4	8-10-12-14-16-18-20-24
1-13/16	8-10-12-14-16-18-20
1-7/8	8-10-12-14-16-18-20-24
1-15/16	8-10-12-14-16-18-20-24-28
2	4-1/2-8-10-12-16-18-20
2-1/16	12-14
2-1/8	12-16-20
2-3/16	12-16
2-1/4	4-½-8-12-14-16-18
2-5/16	12-18
2-3/8	12-16-18
2-1/2	8-10-12
2-9/16	16
2-5/8	12-16-20
2-3/4	16
2-7/8	8-12-16
3	8-16
3-1/4	8-12-16
3-1/2	8-12-16
3-7/8	6
4	8-12



HIGH SPEED LEFT HAND TAPS

SIZE	THREAD
0	80
1	56-64-72
2	56-64
3	56
4	32-36-40-48
5	40-44
6	32-36-40
8	32-36-40
10	24-30-32-40
12	24-28-32
1/4	20-28-32
5/16	18-20-24-28-32
3/8	16-24-32
7/16	14-20-28
1/2	12-13-20-28
9/16	12-18-20-24
5/8	11-12-18-20-24
11/16	11-16-24
3/4	10-16-18-20
13/16	16
7/8	9-12-14-18-20
1	8-12-14-16-18-20
1-1/8	7-12
1-1/4	7-12-16-18
1-3/8	6-8-10-12-16-18-20-24
1-7/16	8-10-12-14-16-18-20
1-1/2	6-8-10-12-16-18-20
1-9/16	8-10-12-16-18-20
1-5/8	8-10-12-14-16-18-20
1-11/16	8-10-12-14-16-18-20
1-3/4	8-10-12-14-16-18-20
1-13/16	8-10-12-14-16-18-20
1-7/8	8-10-12-14-16-18-20
1-15/16	8-10-12-14-16-18-20
2	4½-10-12

• SPECIAL AND LEFT HAND DIES IN STOCK

Prices on Application — We are always adding new sizes

NOTE: Oversize - Undersize - Metric - 64th and 32nd Size Taps Available for Quick Delivery.

Dealer Inquiries Invited

• Are you on our monthly mailing list? Write Dept. T

SID TOOL COMPANY, INC.
CUTTING TOOL SPECIALISTS
26 LAFAYETTE STREET - NEW YORK 13, N. Y.
PHONE: BE 3-4270

Nesting Type Tote Pans, by J. L. Lucas & Sons, Inc., Bridgeport, Conn., are 20″ long by 12″ wide and 6¼″ deep. 16 Ga. Complete data now available.
Circle Inform-A-Gram No. B21.

Dykem Hi-Spot #107 is described in new mailing sheet from the Dykem Company, 2307 N. 11th St., St. Louis 6, Mo. This preparation will not dry out, remains in condition on the work indefinitely. Saves your scraping time.
Circle Inform-A-Gram No. B22.

Compound Microscope Base has 6″ lateral and 4″ traverse micrometer motion. This instrument does double duty as accurate machining table and complete toolmaker's microscope. Erb & Gray, 854 S. Figueroa St., Los Angeles 17, Calif.
Circle Inform-A-Gram No. B23.

Special Boring Bars and Microbore Tools are now packaged together for work demanding highest production. Latest catalog from DeVlieg Microbore Co., 450 Fair Ave., Ferndale, Michigan, has all data.
Circle Inform-A-Gram No. B24.

Large Size and Capacity Range is now available in the Wells metal cutting band saw, which has low first cost. Consistently accurate and dependable production work. Bulletin — Wells Mfg. Corp., 1940 Cedar St., Three Rivers, Michigan.
Circle Inform-A-Gram No. B25.

All types of Pushers and Collets are featured in latest catalog and price list from Benco Collet & Mfg. Co., 1557 East 27th St., Cleveland 14, Ohio. Solid, squirrel cage heavy duty, "Multi-Split" and "Master" with alloy pads all included.
Circle Inform-A-Gram No. B26.

Dimensional Drawings and Detailed Data on all Zagar broachine machines, collet fixtures and multiple spindle gearless drill heads are featured in the Eng'g Manual from Zagar Tool, Inc., 23880 Lakeland Blvd., Cleveland, O. Fully illustrated, valuable and interesting.
Circle Inform-A-Gram No. B27.

"Kennametal Cemented Carbides," is a publication that gives essential mechanical and physical property information on both Kennametal and Kentanium. the heat-resistant titanium carbide composition. The booklet, offered by Kennametal, Inc., Latrobe, Pa., also outlines the various "grades" of the two products besides describing some basic forms available. Illustrations on typical applications are included.
Circle Inform-A-Gram No. B28.

For Small Precision Parts, involving multiple machining operations and high speed production, a brochure on the Potter & Johnson 3U Speed-Flex automatic turret lathe can be helpful. It is now available from Potter & Johnson Co., Pawtucket, R.I.
Circle Inform-A-Gram No. B29.

High-Speed Heat-Treat Furnaces offer wide temperature range for any steels, dies, tools, etc. Carbofrax hearth, G. E. motor, Johnson blower. Full data Johnson Gas Appliance Co., 624 East Ave., Cedar Rapids, Iowa.
Circle Inform-A-Gram No. B30.

Mirror Finishes in Minutes are given by "Micro-Mesh" pure diamond compound. Suitable for any precision finishing problem. For details apply A-1 Abrasive Laboratories, 139 Duane St., N.Y. 13, N.Y.
Circle Inform-A-Gram No. B31.

Finishing Manual from Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, New York, contains operational and parts data on abrasive hand grinder models, which feature improved belt tension device.
Circle Inform-A-Gram No. B32.

Micro Supreme Layout and Identification Dye comes in 7 colors for quick stock marking. It shows up in sharp relief, and dries instantly. Circular and samples from Michigan Chrome & Chemical Co., 6340 E. Jefferson Ave., Detroit, Mich.
Circle Inform-A-Gram No. B33.

Webber Gage Blocks are now made in a carbide having the same coefficient of expansion as steel. Great corrosion resistance and accepted carbide resistance to wear are also features. Webber Gage Co., 12903 Triskett Rd., Cleveland 11.
Circle Inform-A-Gram No. B34.

Special Finger Tip Speed Control instantly set for chatterfree cutting is feature of drill press described in bulletin TP-4 from Electro-Mechano Co., 260 E. Erie St., Milwaukee 2, Wis. Spindle speeds 150-4000, ideal for combined production line set-ups.
Circle Inform-A-Gram No. B35.

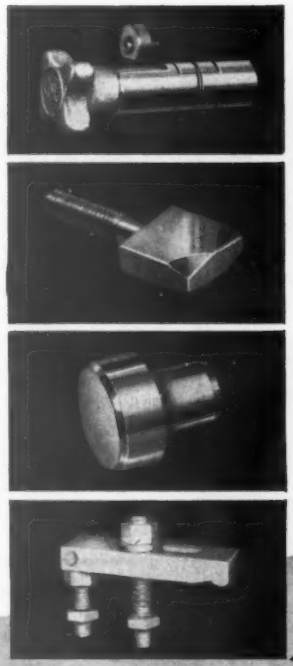
Morse Torque - Limiting Slip Type Friction Clutches, which provide overload protection for a variety of machine drives by functioning as an automatic shear pin mechanism, are the subject of an illustrated engineering data sheet available from Morse Chain Co., 7601 Central Ave., Detroit 10, Mich. The publication includes dimensions and capacities of 4½", 5½" and 6½' diameter adjustable clutches and tables of specifications of standard Morse Type A plain plate roller chain sprockets.
Circle Inform-A-Gram No. B36.

Profusely Illustrated Bulletin #46 covers the Comtorplug internal gage. Use instructions, features, data on prices, sizes and parts. The Comtor Co., 182 Farwell St., Waltham 54, Mass.
Circle Inform-A-Gram No. B37.

A Gear Shaping Booklet for executives is now available from the Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12. Mich. This booklet tells where, when and how the relatively new Shear-Speed gear shaping process fits into economical planning for today's gear production requirements. Request bulletin SP-53.
Circle Inform-A-Gram No. B38.

#B860 Tool and Cutter Grinder featured in current graphically illustrated catalog from K. O. Lee Co., 1115 First Ave., Aberdeen, S. Dakota.
Circle Inform-A-Gram No. B39.

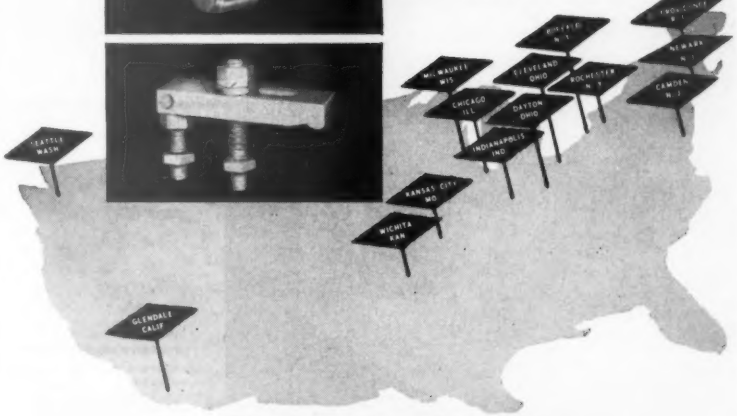
The Latest Delta Catalog tells how a gang setup of 8 Delta 14" drill presses mounted at an angle of about 30° and operated by one man boosted production in a Brooklyn N.Y. machine shop. Catalog from Delta Power Tool Div. of Rockwell Mfg. Co., 400 N. Lexington Ave., Pittsburgh, Pa., gives other pertinent information on Delta machinery.
Circle Inform-A-Gram No. B40.



WESPO

Standard Clamps and Components

AVAILABLE IN STOCK all over the U. S.



IMMEDIATE DELIVERY FROM STOCKS AT FACTORY AND FOLLOWING

T. R. Goldsmith & Son 33 Clyde Ave.—BUFFALO 15, N. Y.
Fidelity Tool Supply, 309 Vine St.—CAMDEN 2, N. J.
J. R. Reinertson & Co., 24 S. Crawford Ave.—CHICAGO 24, Ill.
T. E. Wardrope Agency, 10014 Euclid Ave.—CLEVELAND 6, OHIO
Tool Products Co., 520 Park Ave.—DALLAS 1, TEXAS
H. D. Geisler Co., 2715 Salem Ave.—DAYTON 6, OHIO
Mfgrs. Service Supply, 242 Taunton Ave.—E. PROVIDENCE, R. I.
Art Lewis Product Equipment Co. 422 Magnolia Ave.—GLENDALE 4 CALIF.
Standard Die Supply, 25 E. McCarty St.—INDIANAPOLIS 25, IND.
Ernst Machine, 1606 Oak St.—KANSAS CITY 8 MO.
Bell-Well Sales Co., 1323 N. Water St.—MILWAUKEE 2, WIS.
Columbia Eng. Co., 113-119 Sussex Ave., NEWARK, N. J.
Roessel & Co., 683 Hudson Ave., ROCHESTER 21, N. Y.
H. F. Soderling Co., 1745 4th Ave. South—SEATTLE 4, WASH.
Midwest Die & Supply Co., 1671 Fernwood Ave.—TOLEDO, OHIO
Cummings & Co., 115 E. Lewis St.—WICHITA 2, KAN.

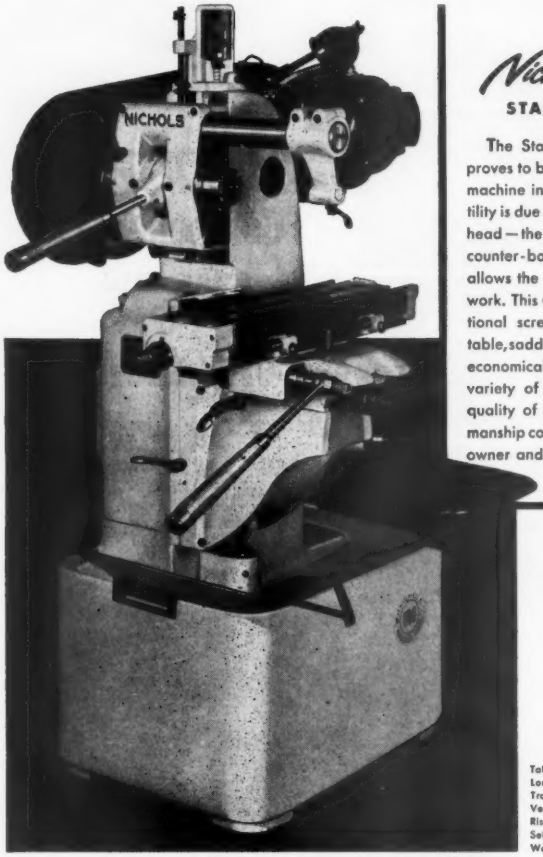
WEST POINT MFG. CO.
26935 W. 7 Mile Road, Detroit 19, Mich.

Specially Designed For the Drill Press, the Yost vise is made in two sizes. Current catalog from Yost Mfg. Co., Meadville, Pennsylvania.
Circle Inform-A-Gram No. B41.

South Bend's New 2-H Turret Lathe catalog is now available. This lathe not only has a 16" swing but also a 1⅜" spindle bore with 1" collet capacity. Action pictures of the lathe and views of its outstanding mechanical features along with complete specifications included in the brochure. Copies available on request from South Bend Lathe Works, 425 E. Madison St., South Bend 22, Ind.
Circle Inform-A-Gram No. B42.

Application Data on DYMO, a new abrasive compound for producing a better finish in less time, is available from the Abrasive Division of the Elgin National Watch Co., Elgin, Ill.
Circle Inform-A-Gram No. B43.

Work-O-Matic Material Handling is described in a new two-color illustrated booklet published by the Union Metal Mfg. Co., Dept. PR, Canton, Ohio. Picture stories describe how end-loading scoops and multi-duty trays go far in integrating production, storage, material movement and disposal.
Circle Inform-A-Gram No. B44.



Nichols Miller
STANDARD MODEL

The Standard Nichols Miller often proves to be the handiest (and busiest) machine in the shop. Its unusual versatility is due to the "rise and fall" spindle head—the spindle being mounted in a counter-balanced sliding head which allows the cutter to be brought to the work. This unique feature, plus conventional screw or lever movements of table, saddle and knee, guarantees fast, economical production on the widest variety of parts. And the unexcelled quality of Nichols' design and workmanship commands the respect of every owner and operator.

"the miller that uses its head!"

CONDENSED SPECIFICATIONS

Table Working Surface	6¾" x 21" or 30"
Longitudinal Travel	10" or 19"
Transverse Travel	7"
Vertical Travel—Knee	13½"
Rise and Fall of Spindle	4½"
Selective Speed Ranges up to 5000 R.P.M.	
Weight	1250 lbs.

Write today for the Nichols general catalog, which describes the six models of Nichols Millers. A sound, color movie, "The Miller that Uses Its Head" is available for free showing. May we reserve it for you?

MANUFACTURED BY W. H. NICHOLS COMPANY • WALTHAM, MASSACHUSETTS

NATIONAL DISTRIBUTORS NICHOLS-MORRIS CORPORATION
74-X MAMARONECK AVE. WHITE PLAINS, N. Y.

Fluid Pressure Boosters that save space and weight, hold pressure indefinitely and operate at speeds of 30 to 450 strokes per minute are described in detail in the latest bulletin released by the Miller Motor Co., 2046 N. Hawthorne Ave., Melrose Park, Ill.
Circle Inform-A-Gram No. B45.

"Component Parts of Jigs and Fixtures" is the title of a fact - filled booklet offered by the Standard Parts Co., 1002 Broadway, Bedford, Ohio. The publication contains drawings, specifications and pictures of over 300 Noble and Stanton fixture parts.
Circle Inform-A-Gram No. B46.

"Get A Better Grip on Production" is the title of the latest catalog on Levermatic and Handmatic Collet chucks and accessories released by the Sutton Tool Co., Sturgis, Mich. Application and specification data included in this brochure.
Circle Inform-A-Gram No. B47.

The Complete Line of Lathes, milling machines and shapers by the Sheldon Machine Co., Inc., is reviewed pictorially in the firm's latest catalog. Accessories and attachments for the machines are also described.
Circle Inform-A-Gram No. B48.

Air and Hydraulic Cylinders as well as air chucks and valves are put on display in the latest brochure released by Anker-Holth Division of the Wellman Engineering Co., 2723 Conner St., Port Huron, Mich.
Circle Inform-A-Gram No. B49.

A New Illustrated Bulletin giving complete specifications on a line of multi-angle universal vises, toolmakers vises, vee blocks and precision rotary tables, all imported from England, is available upon request from DeWitt Equipment Co., 136 Lafayette St., New York 13, N.Y.
Circle Inform-A-Gram No. B50.

Sterling's Easymounts and grinding wheels, a new idea for faster, better carbide tool grinding, are described in detail in a new illustrated brochure. Write to the Sterling Grinding Wheel Division of the Cleveland Quarries Co., Tiffin, Ohio.
Circle Inform-A-Gram No. B51.

NATCO. A case history bulletin, illustrating and describing one automatic production job is available from the National Automatic Tool Co., Inc., Richmond, Ind. The job involves a NATCO Holeway machine and its capacity to perform 98 operations plus automatic inspection on an 8-cylinder V-block in 101 minutes. In the 18-station sequence is one for rotating and vibrating the casting in order to scavenge the chips. This one-job bulletin might give you ideas.
Circle Inform-A-Gram No. B52.

Permanent Magnet Chucks offer safe holding for wet grinding as well as other light machining and inspection operations. Information on Brown & Sharpe's complete line of 11 chuck sizes in both rectangular and rotary models available in illustrated catalog. Write to Brown & Sharpe Mfg., Co., 235 Promenade St. Providence 1, R.I.

Circle Inform-A-Gram No. B53.

Flaw Location is made easy when Turco Dy-Chek and Turco Chek-Spek are applied to the product. Bulletin A-500 outlines the many applications of this completely portable inspection method. The booklet is available from Turco Products. Inc., Terminal Annex 2649, Los Angeles 54, Calif.

Circle Inform-A-Gram No. B54.

Hydraulically Operated Tapping Machines, manufactured by the Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio, are described in a recent folder put out by that company. Illustrations, drawings and charts help present this semi-automatic tapper that incorporates the use of an oil and air cylinder to operate the spindle.

Circle Inform-A-Gram No. B55.

The Sciaky Micro-Metric Upper Electrode Holder fits any resistance spot welder. It is simple to operate and positive in adjustment. More information on this tool for precise alignment of electrode tips available in new catalog yours for the asking from Sciaky Bros., Inc., 4915 W. 67th St., Chicago, Ill.

Circle Inform-A-Gram No. B56.

Wellman Bronze & Aluminum Co. 12800 Shaker Blvd., Cleveland 20, Ohio, has recently published a 20-page catalog, complete with illustrations on its production facilities for a broad range of aluminum, magnesium and bronze castings in sand, semi-permanent and permanent mold form. Metallurgical tables on the characteristics of each alloy, typical castings and data on general laboratory and quality control operations are included. Ask for Catalog No. 53.

Circle Inform-A-Gram No. B57.

Special Machine Tools as well as tooling and adaptations for standard equipment constitute the products of Kearney & Trecker's Special Machinery Division. The performance of this equipment meets problems demanding high volume production as well as exacting dimensional accuracy and fine surface finish. A brochure covering the facilities of the Special Machinery Division and details on the firm's Customer Engineering Service can be had by writing Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wis.

Circle Inform-A-Gram No. B58.

Design and Operating Features of Stenbek Live centers, carried by Axel Jensen & Co., Inc., Bound Brook, N.J., are discussed along with the standard sizes and load ratings of the centers in a recent folder printed by the New Jersey distributor.

Circle Inform-A-Gram No. B59.

Flow Control Valves with a wide and varied field of application are described in full in a 4-page catalog recently released by the A-P Controls Corp., 2450 N. 32nd St. Milwaukee 45, Wis. The folder concerns A-P's Model 67 All Purpose Industrial Solenoid Valves.

Circle Inform-A-Gram No. B60.

The Answer to Die Spring Problems can be found in Bulletin 1953-T now available from The Die Supply Co., 1400 Brookpark Rd., Cleveland, Ohio. The brochure includes information such as specifications and illustrations on DIECO Die springs.

Circle Inform-A-Gram No. B61.

Self - Tapping Screws made by Parker - Kalon eliminate needless operations thus reducing production costs. A new catalog, filled with facts shows how to speed up assembly work with this product. Write to Parker - Kalon Corp., 202 Varick St., New York 14, N.Y.

Circle Inform-A-Gram No. B62.

The Land You Build On Requires Marking Devices

When measuring land areas or construction sites, surveyors mark boundaries with stakes or chalk. Working crews then can depend on these marking devices to insure dimensional limits and safeguarding of property rights.

PUNCH PRESS DIE
Faithfully reproduces and is particularly adapted to large production marking.

SOLID ROLL DIE
Assuring the utmost in accuracy—used in marking machines, lathes and screw machines.

ENGRAVED STEEL SEGMENT DIES
Segment die system ideal for stamping circular and flat work (trademarks, sizes, etc.).

Write for Bulletin SE-130

CADILLAC 45
HYDRAULIC MARKING MACHINE
The Perfect Machine for Flat, Round and Contour Marking

Compact, self-contained and manifold mounted, this machine gives full range of marking depth with one control from extremely shallow impression up to very deep impression. It will mark round, flat and irregular surfaces. Features: repeat action; capacity up to 110 one inch strokes per minute; up to 12,000 lbs. pressure.

For full information, write for Bulletin H-45

CADILLAC STAMP CO.
FACTORY and OFFICES
17303 RYAN ROAD • DETROIT 12, MICH.

"The Miller That Uses Its Head" is how they describe the pneumatic feeding semi - automatic Nichols Miller. A catalog describing the six models of Nichols Millers is available by writing to the Nichols - Morris Corp., 76-X Mamaroneck Ave., White Plains, N.Y.
Circle Inform-A-Gram No. B63.

Skill, Experience and Precision Control applied to each manufacturing step insures maximum performance of collet, made by the Balas Collet Mfg. Co., 1557 E. 27th St., Cleveland. The company has literature on its product available to all interested parties.
Circle Inform-A-Gram No. B64.

The Sciaky SPT 2 Machine is one ers available in 50 KVA, 75 KVA and 100 KVA at 50% cycle. This machine is well described in illustrated Bulletin 306-1 from Sciaky Bros., 4915 W. 67th St., Chicago, Ill.
Circle Inform-A-Gram No. B65.

The Hovis Universal Washer Dies provide a master holder to eliminate making a new die for every type washer or blank. With this Universal Washer Die by merely changing 5 small easily removable parts, the new washer or blank is produced. Literature on the product can be had from Hovis Screwlock Co., 8100 E. Nine Mile Road, Van Dyke, Mich.
Circle Inform-A-Gram No. B66.

Perkins 550B Geared Press

Perkins Model B Standard Presses are built for heavy duty service and high production. They are quickly adaptable to most types of work and are readily accessible. They have the inclinable feature and may be furnished with plain flywheel drive for faster production or back gearing for heavy blanking and forming operations.

Model B Presses are supplied with a variety of strokes and ample die space for highly efficient operation and to meet most requirements.

Your inquiries are welcomed. Write for catalog.

PRESSES BUILT TO SPECIAL SPECIFICATIONS

Perkins Power Presses SINCE 1885

PERKINS MACHINE CO.
WARREN, MASSACHUSETTS

Wade's Fits-All Coolant System for bench drill presses of all popular makes is explaned in detail in a 4-page folder complete with diagrams. The bulletin is offered by Wade and Sons, 914 E. Truman Rd., Independence. Mo.
Circle Inform-A-Gram No. B67.

Carbide Tipped Reamers, drills, milling cutters, tool bits and other tools for almost every machining operation are illustrated in the new 82-page catalog of Wendt-Sonis Co., Hannibal, Mo. This catalog, No. 53, also contains illustrations, drawings and tool dimension tables.
Circle Inform-A-Gram No. B68.

Equipment for Precision Finishing of Gears up to 15' in diameter for marine, railroad, power plant and ordnance use is covered in a new 8-page illustrated bulletin available from Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich. Advantages of such equipment are shown along with machine and motor specifications.
Circle Inform-A-Gram No. B69.

A High-Carbon Chrome Steel, manufactured by the Timken Co., is a through hardening steel in moderate sections and can often be used in place of more expensive steels. It can be heat-treated to file hardness and tempered back to any desired point. Literature on this material available from the Timken Roller Bearing Co., Steel and Tube Division, Canton 6, Ohio.
Circle Inform-A-Gram No. B70.

SPS Has New Unbrako Products Folder. Just off the press is a four-page illustrated folder describing the advantages of the Unbrako socket screws. Included are descriptions of socket screw keys, square head set screws, pressure plugs and dowel pins. Address requests for this folder to Standard Pressed Steel Co., Box 600, Jenkintown, Pa.
Circle Inform-A-Gram No. B71.

Milne's Hollow Die Catalog illustrates and describes the company's air hardening, oil hardening tool steels besides including a section on the Graphic Hollow Die Steel. It's available to one and all by writing A. Milne & Co., 745 Washington St., New York 14, N.Y.
Circle Inform-A-Gram No. B72.

20TH Century, a Persuasive Abrasive, has a place in many foundries and metal - working plants everywhere. It is a product of the Cleveland Metal Abrasive Co., 800 E. 67th St., Cleveland 8, Ohio. Information and brochure on this and other of the firm's products, such as quality shot, grit and powder, hard iron, cut wire and cast steel abrasives available upon request.
Circle Inform-A-Gram No. B73.

Single and Double Crank Straight Side Presses, two new machines produced by the Minster Machine Co., Minster, Ohio, are described in full in two new brochures offered. The publications also contain detail specifications of the machines.
Circle Inform-A-Gram No. B74.

Applications of Press Brakes are among the many items discussed in the most recent illustrated booklet put out by the Cincinnati Shaper Co., Hope, Garrard and Elam Sts., Cincinnati 25, Ohio. The booklet also describes the Cincinnati line of all-steel press brakes.
Circle Inform-A-Gram No. B75.

Three Types of Cable Conveyors are covered in a 4-page compact bulletin issued by the E. W. Buschman Co., 4401 Clifton Ave., Cincinnati 32, Ohio. The folder contains a wealth of information on the conveyors including load limits, carrier spacing, beam specifications and other useful data.
Circle Inform-A-Gram No. B76.

Application of Industrial Diamonds throughout all segments of industry is featured in a new publication launched by the Industrial Diamond Association of America, Inc., 124 E. 40th St., New York 16, N.Y. Sections of this booklet on diamond dies, drill bits, diamond turning and boring tools and diamond grinding of tungsten carbide will be of particular interest to the metalworking field.
Circle Inform-A-Gram No. B77.

The Center - Mike measures hole center-to-center distances quickly and accurately regardless of hole sizes. The principle of this new measuring technique is explained in a recent folder published by Sorensen Center-Mikes, Inc., 264 Kossuth St., Bridgeport 8, Conn.
Circle-Inform-A-Gram No. B78.

Die Set Pullers that facilitate removing the punch holder from the die shoe by a straight upward pull have been developed by Acro Metal Stamping Co., 330 E. Reservoir Ave., Milwaukee 12, Wis. Patented indexed screws control the upward movement of the puller. Data on this and other Acro products, drill rod racks, leader pin oilers and automatic lubricators make up Bulletin TP-52.
Circle Inform-A-Gram No. B79.

Through Process Control you can spot defective parts to help spot defective processes in raw materials, castings, forgings, machining, heat treating, grinding, welding and ceramics production. The Manaflux method detects cracks of all types, blowholes, porosity, stresses and faulty welds among other things. For further information send for the Process Control folder. Write to Magnaflux Corp., 5900 Northwest Highway, Chicago, Ill.
Circle Inform-A-Gram No. B80.

The New Postiv-Lok End Mills, made by the Putnam Tool Co., 2985 Charlevoix Ave., Detroit 7, Mich., will help eliminate integral tapered shanks and cumbersome tool changing. Write for catalog on this smooth, chatterfree cutting tool.
Circle Inform-A-Gram No. B81.

Organic Products Co., P.O. Box 428, Irving, Texas is offering a 10-page brochure and color card on its new Stamp-Ink, a non-etching, non-corrosive, non-smearing and fast drying material. This Stamp-Ink is useable on tools. metals, plastics, glass, fabrics, etc.
Circle Inform-A-Gram No. B82.

Over 50 New Siewek Engineered Fixture Clamps in various sizes and styles are displayed in Catalog 8 published by the Siewek Tool Co., 2862 E. Grand Blvd., Detroit 2, Mich. The booklet also contains full-size tracing templates.
Circle Inform-A-Gram No. B83.

For Electrical, Chemical and Mechanical applications, Formica sets a high standard in laminated plastics. How it is produced and used is described in a multi-colored brochure available from the Formica Co., 4614 Spring Grove Ave., Cincinnati 32, Ohio.
Circle Inform-A-Gram No. B84.

Supports 10 tons in any position
LEMPCO
SAF-T-PROP
Clamp/support for work on machine tool tables
Props dies and press open for service.
Pull the ram up to any position and it remains there supporting loads up to 10 tons. To lower, turn SAFTPROP upside down and inner cylinder falls back into original position. No screws, ratchets, shear pins, or hydraulics. 100% positive support by solid steel mass.
Scores of uses in a shop; 1. as a clamp support for holding down large work pieces on grinders, shapers or millers. 2. separates punch and die while aligning or replacing die segments or when removing and storing dies; 3. acts as safety stop against accidental ram movements. Sold in sets of 4 with a range from 2½" to 12" high. Write for folder on how SAFTPROPS save time and protect workers from accidents.
Infinitely adjustable as a spacer or clamp support in holding down work on miller, planer, shaper and other machine tools.
Lempco Products
Props open die sets while repair or alignment of die is being made.
SAFTPROPS used as a safety stop against accidental movement of ram while operator is working under ram.
Patents pending and applied for.
Sold in sets of 4
SAFTPROPS can be bought individually or in sets. A set consists of one each of the following sizes: 2½"—3⅜"—5⅜"—8" high; when fully extended they measure respectively 3⅜" — 5⅜"—8"—12" high.
A B C D
$18.50 SET
Lempco Products, Inc., 5500 Dunham Rd. (Industrial Division), Bedford, O.
LEMPCO
for 35 years... a leading builder of machine tools

MEN YOU SHOULD KNOW . . . . . .

Theodor Wutscher

Thomas C. Tiearney

Donald D. Brock

Gordon W. Smithson

R. Paul Toeppen

Hydropress, Inc. of New York reports that Theodor Wutscher is now chief designer at the firm's Rolling Mill Division plant.

◆

Thomas C. Tiearney has been promoted to the sales engineering staff of the Honan-Crane Corp. of Lebanon, Ind. In his new position, Tiearney will service Honan-Crane's Ford Motor Co. accounts in Detroit, Chicago and Cleveland.

◆

Donald D. Brock has joined the Honan-Crane Corp. as sales engineer for the Kansas City area. Previously, Brock was with the Sinclair Refining Co. in Kansas City and during World War II, served as a weather officer with the Army Air Corp.

◆

Chief engineer of the Potter & Johnston Co., Pawtucket, R.I., is Gordon W. Smithson, associated with the firm since 1936. In his new position, Smithson will direct all product improvement, engineering and research, both mechanical and electrical, on Potter & Johnston machine tools.

◆

R. Paul Toeppen has been elected vice president of the James H. Knapp Co. in Los Angeles, Calif. For the past 10 months Toeppen has been general manager of the company. Prior to joining Knapp, the new vice president was an engineering consultant and during World War II served the aircraft industry as a production engineering consultant.

Raise the feed . . .
Cut your die costs with . . .

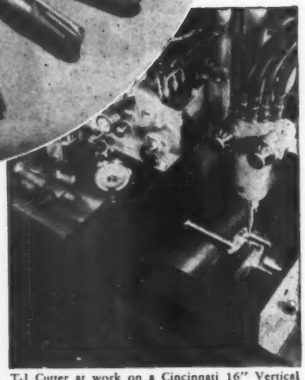
LARGEST SELLING CUTTERS FOR TOUGH DIE STEELS

You get more work between grinds . . . with these *extra rugged* T-J Die Sinking Milling Cutters. That's why they're top favorites in die and forge shops everywhere! T-J Cutters are correctly designed for speed, accuracy and long life . . . hold a sharp edge longer . . . less breakage! Made from an extremely high grade steel . . . properly machined . . . scientifically heat-treated and accurately ground. Wide range of styles and sizes to *reduce your die costs!* Send for new catalog 4-153. The Tomkins-Johnson Co., Jackson, Mich.

FOR TOUGH JOBS SPECIFY T-J

TOMKINS-JOHNSON

RIVITORS AIR AND HYDRAULIC CYLINDERS CUTTERS CLINCHORS



T-J Cutter at work on a Cincinnati 16" Vertical Hydrotel, latest design Die Sinker. A cutter of the right design and heat treatment for this high speed work in tough die steels, making posible the maximum efficiency of these new machines.

. . . . . MEN YOU SHOULD KNOW

William B. Crump

Erhardt C. Koerper

Paul C. Funkhouser

Charles R. Van Riper

Robert F. Lotz

William B. Crump, a member of the Society of Automotive Engineers and a wartime aircraft maintenance officer, is the new sales engineer in charge of the Detroit office of May-Fran Engineering Co. of Cleveland.

◆

The appointment of Erhardt C. Koerper as works manager of Ampco Metal, Inc., in Milwaukee, Wis., was recently announced. For the past 9 years, Koerper has been assistant executive engineer at the A. O. Smith Corp.

◆

Henney Motor Co., Inc., of Freeport, Ill., announces the appointment of Paul C. Funkhouser as vice president in charge of operations. Prior to joining Henney Motor, Funkhouser served as a consultant production engineer for the Plymouth division of the Chrysler Corporation.

◆

District sales engineer for the Norton Company's Chicago office is Charles R. Van Riper, a veteran of 24 years service with the Worcester, Mass. firm. Van Riper will organize and direct field engineering activities in the Chicago area.

◆

The opening of a Mid-Atlantic Division office and the appointment of Robert F. Lotz as manager of the new branch has been announced by the Erickson Tool Co. of Cleveland. Ohio. In his new capacity, Lotz will serve the users of Erickson precision holding tools in Eastern Pennsylvania. Delaware and Maryland.

There is a Johnson Dealer Near You

This JOHNSON Model B

offers all the Features of a BIG MACHINE in this handy Small Saw. Cuts 5" rounds, 10" flats

WRITE FOR DETAILS

JOHNSON MANUFACTURING CORP.
ALBION, MICHIGAN

. . . Cocperation, from page 81

terests involved and permits discussion of all phases of the material problem.

The Material Utilization Committee also functions to bring together all the specialists when a major material cost reduction drive is underway.

To illustrate this function, a few years ago the committee put on such a drive to reduce the material cost in our railroad journal boxes and bearings. Every part of one of these boxes and bearings was laid out on a table and each was tagged with its material cost.

Due to the cooperative efforts of the committee, this group made it possible to redesign many of the parts and revise the method of manufacture to effect appreciable material savings.

In a journal box the housing is the heaviest part. Originally made from a purchased steel casting it weighed approximately 385 pounds. Working with our Metallurgical and Purchasing departments to coordinate design with foundry practices, the product engineers redesigned the housing and reduced its weight by one hundred pounds. While redesigning the housing, further consideration was also given to the method of manufacture and the machining time also was reduced.

Some parts which were made from steel castings were changed to malleable iron; others were changed to forgings, all resulting in reduced cost at no sacrifice in quality.

All these changes had to be tested, both in the bearings test laboratories and in manufacturing.

To name a few more material projects which have been successfully accomplished through the efforts of this committee, we have installed a forge shop to make our own forgings; we have also installed a slitter for flat stock, and wire drawing equipment for the cold drawn wire used to cold form rollers.

These projects have **not** only resulted in economics but also have eased our procurement and inventory problems.

In our forge shop we stock relatively few bar sizes for a multitude of forging sizes.

For 35 cold drawn sizes we stock seven sizes of hot rolled wire.

The number of thicknesses in which our wide cold rolled coils are purchased has also been reduced since the use of a slitter enables us to cut a wide coil into narrow coils of any desired width.

We could not have achieved these results if it had not been for the coordinated efforts of all the divisions concerned.

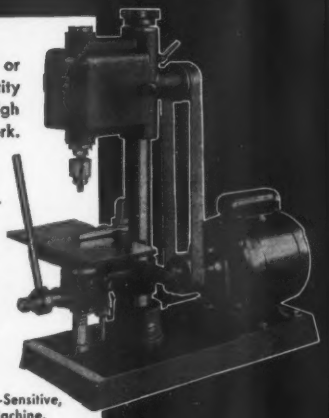
The Material Utilization Committee makes it possible to coordinate the efforts of all the departments which have any contribution to make to the proper selection and effective utilization of materials.

As an adjunct to the Material Utilization Committee we have a group of engineers in the Mechanical Development group who are assigned solely to materials engineering.

YOU CAN DRILL OR TAP TINY, PRECISION HOLES
. . . ON A *PRODUCTION* BASIS . . . WITH
MINIMUM SCRAP AND *MINIMUM* TAP AND DRILL BREAKAGE
BUT YOU **MUST** FIT THE TOOL TO THE JOB

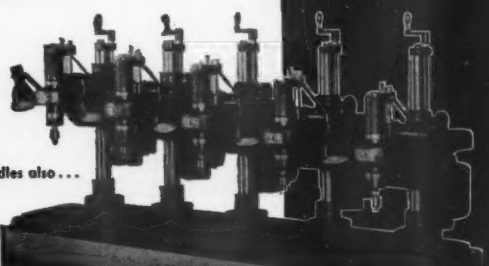
When your job calls for tiny, precision holes, drilled or tapped, rely on this; such holes can be produced in quantity and within allowed tolerances only on super sensitive, high precision machines designed and built for this class of work.

HAMILTON Drilling Machines and Tapping Machines are super sensitive and extra accurate; designed and built for the production of tiny, precision holes. The drilling machines produce holes up to 0.3125" maximum — to the center of 10" — in any drillable material — on fast production schedules. The tapping machine is designed to use the smallest and finest tap and up to 10-32 inclusive.



The HAMILTON® Super-Sensitive, Small Hole Tapping Machine.

The Hamilton VARIMATIC® Super-Sensitive, Variable Speed, Small Hole Drilling Machine.



Multiple spindles also . . .

Acquaint yourself with Hamilton Super Sensitive, Small Hole Drilling and Tapping Machines and be ready for the challenge ahead. Ask for our FREE Bulletin DT-5308.

THE Hamilton TOOL COMPANY
832 SO. NINTH STREET • HAMILTON • OHIO • U • S • A

The developments of this group are thoroughly tested for performance by members of the product engineering department, and pilot runs are processed on production equipment and by manufacturing personnel before these developments are accepted as standard.

We believe that the nucleus of the materials engineering program should be centered in the mechanical development section in order to achieve maximum effectiveness.

Tailoring material specifications to meet existing tooling and equipment requirements is frequently an easy way out. Redesigning tools and even replacement of equipment can be at times more practical. This requires personnel who not only know materials, but can also make them work.

Here is an example of the kind of contributions that are made by the material specialists of the mechanical development group.

For many years we made our roller separators from a very special low carbon hot rolled steel. Only one supplier could be found who could meet the specifications for a material which would be drawn and pierced on the special equipment which had been developed for this work.

After our material engineering group was organized, it took up this problem and developed a method of using commerical quality cold rolled steel by tailoring the tool material and lubricants to fit this material.

The use of commerical cold rolled steel for roller separators has two advantages over the hot rolled. It can be obtained from several sources and is more economical. The economies evolve from the fact that commerical cold rolled steel in wide sheets which are slit to required widths costs less than special grades of narrow hot rolled steels.

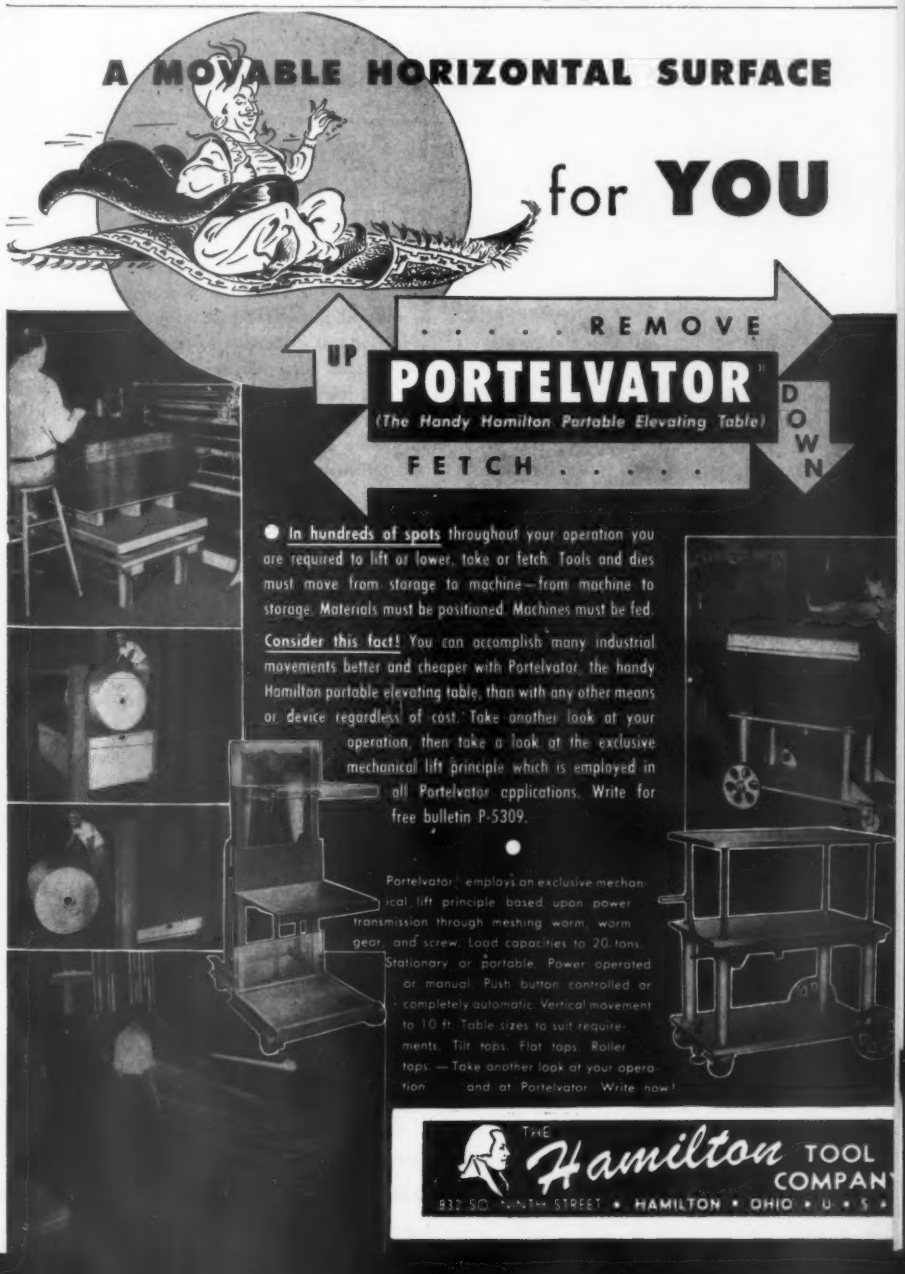
Problems were encountered when cold rolled material was first introduced. Galling developed in the drawing operation due to the smoothness of the cold rolled finish. The lime on the hot rolled material, acting as a carrier for the lubricant, had prevented galling.

After some developing work, we substituted tungsten carbide inserts on the punches and dies, and not only was galling eliminated on the cold rolled material, but the surface finish was highly improved.

The pocket piercing operation also created difficulties. However, the addition of a sulphur cutting oil solution improved tool life until it compared with, and exceeded that obtained with hot rolled material.

Here again, the cooperation of the purchasing, metallurgical, and manufacturing divisions had to be obtained before this project could be accomplished.

As you can see, almost every department in Hyatt had a hand in these material developments. The coordination developed by our central Material Utilization Committee and the work of the materials engineering group, together with our management's deep interest have contributed greatly to the success of our material selection and improvement program.


A MOVABLE HORIZONTAL SURFACE
for YOU
. . . . . REMOVE
UP
PORTELVATOR
(The Handy Hamilton Portable Elevating Table)
DOWN
FETCH . . . .
● In hundreds of spots throughout your operation you are required to lift or lower, take or fetch. Tools and dies must move from storage to machine—from machine to storage. Materials must be positioned. Machines must be fed.
Consider this fact! You can accomplish many industrial movements better and cheaper with Portelvator, the handy Hamilton portable elevating table, than with any other means or device regardless of cost. Take another look at your operation, then take a look at the exclusive mechanical lift principle which is employed in all Portelvator applications. Write for free bulletin P-5309.
●
Portelvator employs an exclusive mechanical lift principle based upon power transmission through meshing worm, worm gear, and screw. Load capacities to 20 tons. Stationary or portable. Power operated or manual. Push button controlled or completely automatic. Vertical movement to 10 ft. Table sizes to suit requirements. Tilt tops. Flat tops. Roller tops. — Take another look at your operation and at Portelvator. Write now!
THE Hamilton TOOL COMPANY
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High-Speed Broaching Machine

The new Lapointe electro-mechanical drive horizontal broaching machine is described as "the most outstanding development in broaching since the origin of broaching itself, more than fifty years ago". Broaching speeds up to 300 fpm and more not only provide greatly increased production, but the machine produces a better finish while at the same time providing greater accuracy through freer cutting action.

Carbide-tooth broaches can be used at these high speeds to broach many jobs that heretofore were impossible of broaching.

Optional features are dual speed and dual cycle. The dual speed feature permits the machine to be operated at two or more pre-determined speeds for the same broaching stroke. Dual cycle is the exclusive Lapointe development that has been designed for the successful broaching of jet engine components without requiring tool change-overs for the accuracy required. Limit switches are used for operating these dual speed and dual cycle features.

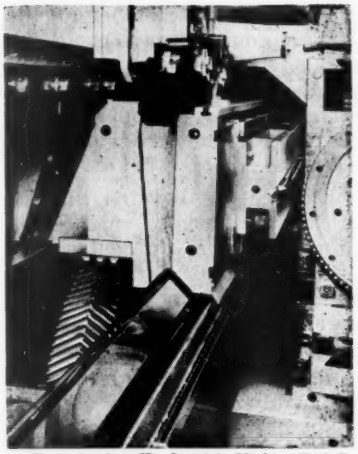

Photo courtesy The Lapointe Machine Tool Co.

Fig. 1 Broaching speeds up to 300 fpm, and more, are now possible with the electro-mechanical drive broaching machine which has a massive main slide driven by a continuous teeth herringbone bull gear and rack.

A very large main driving gear, herringbone type, drives the massive slide, riding on phenolic ways. The main slide is adjustable, guided and supported throughout the entire stroke.

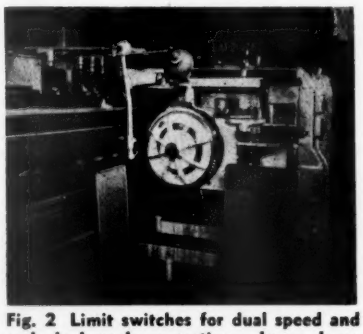

Fig. 2 Limit switches for dual speed and and dual cycle operation, shown here, provide flexibility and versatility for this broaching machine.

Two slide widths are offered, 16" and 24", with strokes up to 180 inches. Drives up to 200 ph can be had, depending on the speed desired and the amount of material to be removed.

The need for skilled operators has been substantially reduced, due to such features as the sim-

VERSATILITY
WITH PRECISION!
STEINEL
HORIZONTAL & VERTICAL
MILLING MACHINES
The many speed ranges available, rigid construction and high precision workmanship make these machines ideal for the production of parts in the toolroom or production shop.
You'll find that ease of operation enables the Steinel Milling Machines to handle a large variety of work with efficiency, accuracy and complete dependability.
HORIZONTAL MILLING MACHINE MODEL SH 4d
VERTICAL MILLING MACHINE MODEL SV 4d
STOCK DELIVERY
PARTIAL SPECIFICATIONS
SH 4d
SV 4d
Table working surface ..... 24"x7¾" 24"x7¾"
Table traverse ... 11½" 11½"
Spindle speeds (6) ..... 63-630 rpm or 125-1250 rpm 224-2240 rpm
Motor ..... 1 or 1½ HP 1 HP
• Write today for full information and specifications
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for machine tools!
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Manufacturers • Merchants • Distributors
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plified electric controls. These are completely flexible for setting-up purposes, and have a locking attachment to prevent damage to machine, tools or operator when automatic cycle is used. Safety of the operator has been a chief consideration in designing this high-speed broaching machine. Cutters are at eye level and can easily be examined at any time; maintenance is simplified because everything is accessible; the machine is fitted for hoist attachment.

Two types of work tables are available for the machine. It is equipped with either the In-and-Out Table, or with the outstanding Lapointe Tip-Down Table. Indexing fixtures or other special work holding units can be adapted to the table.

Hazardous Operations Remotely Controlled

To solve difficult and highly special band sawing and band machining problems not within the scope of many standard models, special band machines are now built to customers' orders. Typical of some of the

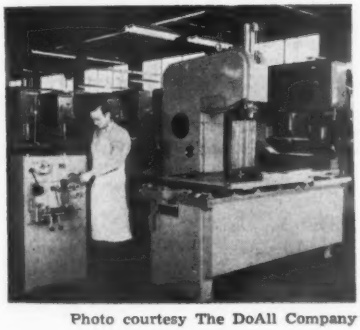


Photo courtesy The DoAll Company

"specials" produced is the extra work height, heavy duty model shown in the illustration. This machine, manufactured for a U. S. Naval Ordinance Test Station, will be used to cut explosives (shell, etc.) apart to permit inspection of their interiors. To offset the possibility of harm to the operator should an explosion occur, the machine is arranged for remote control from a relatively distant point of safety.

This special band machine was adapted from the manufacturer's most versatile model — the MP-20 — which accepts band tools for filing, grinding and polishing as well as sawing. However, this special band machine has a work height capacity of 24", a 36" stroke, and is equipped with a hydraulically powered, heavy duty table. It incorporates the features of the standard MP-20 variable band speed control up to 10,000 feet per minute; automatic hydraulic brakes which stop the machine when the band tool breaks; facilities for air jet, mist or floor cooling; hydraulic positioning of the tool guide post; hydraulic tensioning of the saw band to limits controlled by the operator; two-way table tilt for cutting at an angle and other exclusive features.

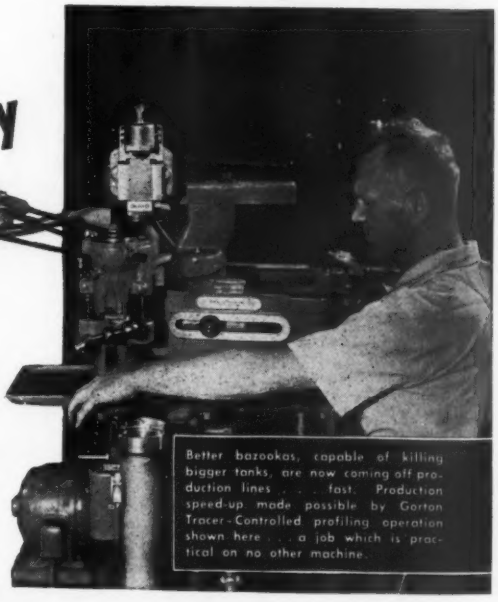
Controls in this band machine, such as the blade welder and complete standard control panel normally incorporated into the column of the standard model MP-20, are housed separately in a remote control panel. The final installation of this separate control unit will permit every phase of

. . . Continued on page 100

Pantography at Work

★

Inside profiling operation produces more than 36 pieces per hour with Gorton Tracer Control. Approximate time by the next best method . . . one piece every two hours.



Better bazookas, capable of killing bigger tanks, are now coming off production lines . . . fast. Production speed-up made possible by Gorton Tracer-Controlled profiling operation shown here . . . a job which is practical on no other machine.

GORTON

• IMPROVES QUALITY
• INCREASES PRODUCTION • CUTS COSTS

On many all-but-impossible jobs, Gorton Tracer-Controlled Pantographs and Duplicators speed up production on military or industrial contracts. High surface finish results from spindle speeds up to 45,000 R.P.M. Accuracy results from the use of over-size masters, patterns, or templates together with the reduction ratio which is exclusively characteristic of the pantograph. Whether a dozen or a thousand pieces, each is identical to the first. Work piece size varies from instrument parts to areas of 10 to 20 feet.

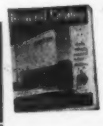
Gorton tracer-controlled equipment quickly pays for itself in profiling, routing, die sinking, mold cutting, counterboring, chamfering, grooving, graduating, engraving as well as many other standard or special operations on ferrous or non-ferrous metals and plastics where work is flat, uniformly curved, cylindrical, spherical or irregular in shape.

Mail the coupon below for General Catalog illustrating the complete Gorton line.

PRODUCTION DATA—

JOB: Profile 6 locking lugs for male and female sections of new 3.5" Bazooka
MATERIAL: Aluminum alloy
CUTTER: 5/32" dia. single flute, fast spiral H. S. steel running at 3,900 R.P.M., without coolant
MASTER: 2 masters: one for male and one for female sections; 3 times oversize, traced manually
HOLDING FIXTURE: Pneumatic-operated internal expanding type
APPROX. TIME: 36 pieces per hour
ALTERNATE METHODS: None practical

GEORGE GORTON MACHINE CO.



1208 Racine St., Racine, Wis., U.S.A.

Please send at once complete information about the Gorton line contained in Bulletin 1655-1208

Firm .....
Name .....
Title .....
Address .....
City, State .....

. . . CHUCKS, from page 80

tion which mates with that of the collet.

6. The retaining nut. Tightened by light hand pressure on to the threaded neck, this retains sleeve in correct position.

In operation, any tendency of the cutter (3) to turn creates a drawing action on the cutters threaded end which forces the collet (4) down the shank of the cutter. The tapered portion of the collet is thus pressed into the mating taper of the sleeve (5) which in turn causes the collet to grip the shank of the cutter even tighter. The result: automatic self-locking grip.

At the speeds and feeds common in today's milling practice, the conventional end mill with high power spiral flutes has a marked tendency to slip or creep from its proper location in the adaptor. This tendency can result in the spoiling of expensive components and work pieces and often results in the breakage of many cutters. Autolock held cutters cannot possibly slip, pull down or push up as the heavier the cut taken the tighter the cutter becomes in the collet. In addition, because the cutter is held rigid and runs dead true, size slots and keyways can be cut in one pass with a size cutter. The result: increased production with fewer cutter breakages and a minimum of scrapped work.

The two Autolock Chucks are designed with tapers to fit any milling machine, and thus supersede the numerous adaptors and sleeves commonly required.

Because hand pressure only is needed to fix cutters in the Autolock Chuck, the machine spindle is not subjected to harsh treatment through use of heavy spanners.

Higher speeds and feeds obtainable by use of Autolock can be largely explained by the fact that each tooth in an Autolock-held cutter takes an evenly distributed tooth load. Here is an example of Autolock performance: In a piece of mild steel, a slot can be cut 1/2" wide and 3/4" deep in one cut at 4" a minute with a guaranteed accuracy of .0005". For complete information, write Clarkson Incorporated, 320 Ontario Street, Toledo, Ohio, or Circle Inform-A-Gram No. D 1.

DIECO Die Sets
1728 Combinations
All-Steel Semi-Steel
Special and Stock-Sizes

DIECO Guide Pins and Bushings
Precision, Commercial and Shoulder

DIECO Die Springs
500 Stock Sizes
3 pressures:
Medium, Medium-High and High

Performance is Proof!

Industry acclaims DIECO finer precision craftsmanship: "DIECO Die Sets are smoother operating—need no prybars." ". . . mount dies easier, quicker." ". . . longer die-life." ". . . less down-time saves man-hours." ". . . better production, bigger profits."
Demand DIECO for socket head screws and ALL your tool, die and machine shop accessories.

Send for your DIECO Catalog, now.

The DIE SUPPLY Co.

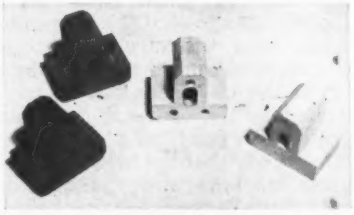
CLEVELAND 9: 1400 Brookpark Rd. ★ SHadyside 1-9000 ★ TWX-CV-202
PITTSBURGH 6: 122 S. Sheridan Ave. ★ EMerson 1-0440
DAYTON 4: The Die Supply Sales Co., 311 Vermont Ave. ★ MI. 9691 ★ TWX-DY-85
BUFFALO 1: Die Supply Corporation, 234 Carolina St. ★ MAdison 1964
ST. LOUIS 13: Scott Special Tools, Inc., 1252 N. Kingshighway ★ FOrest 3454

Wet Blasting De-Scales Die Parts

Manual polishing operations involved in the removal of heat treat scale from die parts are completely eliminated by wet blasting, it has been found by die makers. Sizable reductions in the amount of hand polishing required for dimensioning the parts after scale removal are also experienced, because the close abrasion control which can be exercised during wet blasting cleaning permits closer machining and grinding of the work prior to hardening.

One job, consisting of 17 identical die inserts manufactured by the Unified Tool Die & Manufacturing Co., Chicago, Illinois, had the surfacing time after heat treating reduced over five hours, due to this process of scale removal. The die inserts are shown in Figure 1. They are sized 1"

x 1½" x 1½" high. The cleaning of the punch inserts was reduced 10 hours. These 15 hours



Photos courtesy American Wheelabrator & Equipment Corp.

Fig. 1. Four inserts manufactured by Unified Tool Die & Manufacturing Co., Chicago, Illinois, for a metal-cutting die. The two inserts at the left show scale-covered condition after hardening. The two at right show scale-free condition after wet blasting.

represented an 80% polishing time saving.

Both the heat treating and wet blasting of the company's parts are done at Perfection Tool & Metal Heat Treating Co., Chicago, Illinois. Cleaning time for the die inserts in a Liquamatte machine, with 325 NE Liquabrasive as the cleaning medium, was less than five minutes per part. The operator stands outside the machine with his arms through gauntlets (Figure 2) and manipulates work in

Fig. 2. The Liquamatte wet blasting machine used by Perfection Tool & Metal Heat Treat Co. for cleaning the above work for the Unified Tool Die & Manufacturing Co.

front of the abrasive gun inside. The Liquabrasive is mechanically suspended in water by means of agitation furnished by a vertical centrifugal pump, and the abrasive slurry is propelled at the work by 80 to 100 p.s.i. of compressed air.

Dimensioning of these inserts was made considerably easier. The entire surface of each piece is finally dimensioned from the hole in the center. Prior to the time this die-making company made use of wet blasting, the die maker polished the scale off the surfaces to get to bare metal for final dimensioning rather than grinding them, because grinding scale sometimes produced surface cracks on hardened materials. Surface cracks do not occur with wet blasting.

The die maker was able to dimension the hole to exactly the correct size before heat treating, since with wet blasting it is possible to maintain tolerance within .0001" where necessary, and sharp lines, corners, etc., on work remain undamaged and unaltered. With this hole perfectly dimensioned and the whole part clean after wet blasting, it was possible for him to produce the necessary outside dimensions without delay.

For Your Future
U. S.
SAVINGS BONDS

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Precision Gage Blocks

Now Offers . . .

QUALITY . . . Lasting precision — in millionths

PRICE . . . Traditionally low prices in spite of rising costs

DELIVERY . . . FONDA now ships most orders direct from stock.

Both Square and Rectangular Now in all Three Materials

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CARBIDE
CHROME CARBIDE

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38 Broad Street, Port Chester 1, N. Y.

Send for full information. Just attach this coupon to your business letterhead.

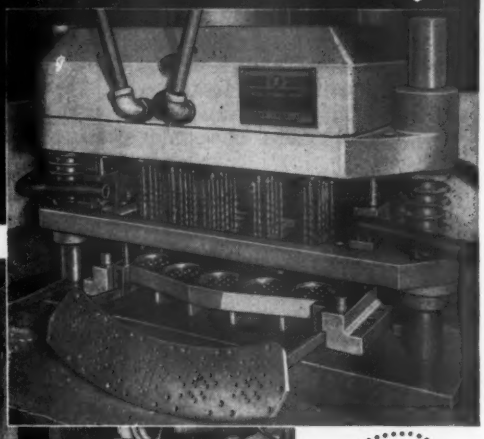
Please send me your descriptive brochure, "Precision In Millionths"

NAME_____TITLE_____
COMPANY_____
BUSINESS ADDRESS_____
CITY_____ZONE___STATE_____

UNITED AIRCRAFT chooses

Zagar engineered drilling

for J-47 Jet Engine Parts



UAP UNITED AIRCRAFT PRODUCTS, INC.

Zagar evolves best method for drilling 383 holes in header plates and manifold for liquid-to-liquid heat-exchanger. Photographs by courtesy of UNITED AIRCRAFT PRODUCTS, INC., Dayton, Ohio.

The job: to save most time and money in drilling 365 holes .200 diameter and 18 holes 5/16" diameter. Zagar *engineered drilling* licked it.

● You, too, can profit from the often demonstrated ability of Zagar gearless drillheads to drill hundreds of holes at one pass. Zagar's engineered drilling permits record-breaking performance without drill breakage. Used alone or combined into 4-post machines, Zagar gearless drillheads drill any material and any size hole on all centers as close as twice the drill diameter. No application is too difficult for Zagar standard machines 16", 24", 32" and 40", or for special machines to fit your needs exactly. All this, at a new low cost of tooling.

Ask for Zagar Catalog "T-8"

ZAGAR TOOL, INC.

24000 LAKELAND BLVD. • CLEVELAND 23, OHIO

Zagar TOOLS FOR INDUSTRY and SPECIAL MACHINERY

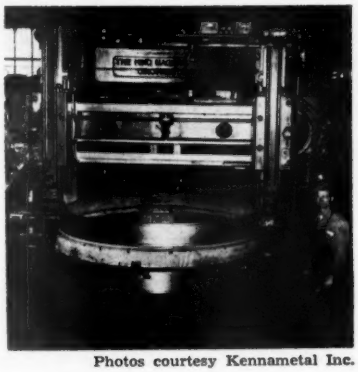
. . . Hazards, from page 97

the machine operation to be carried on at a safe distance from the machine itself. Saw band speed, speed of the hydraulic table, feed pressure, height of the tool guide post, band tension, tilt of the table, etc. can be controlled by the operator from his protected position. Hydraulic lines and wiring between the band machine and the control unit will be encased in heavy wall conduit.

Engineering and research facilities of the company are always available for such special application.

Carbide Tooling Puts "New Life" In Old Machines

Today's modern machine tools have all the speed, power and rigidity necessary to make the most economical use of tungsten carbide tooling. However, very satisfactory results are constantly being obtained even on old equipment that is still in good operating condition. Using a bit



Photos courtesy Kennametal Inc.

of ingenuity and tungsten carbide tooling, the United Concrete Pipe Co., Baldwin Park, Calif., recently gave new life to their old 72-inch belt-driven boring mill by using it for machining 84-inch diameter cast iron pipe joints made of a special iron to resist sewer gas corrosion. The operation consists of rough and finish profiling, facing, and boring at 89 surface feet per minute (maximum).

Of patricular interest is the profiling performed with a standard Kennamatic triangular in-

. . . *Continued on page 154*

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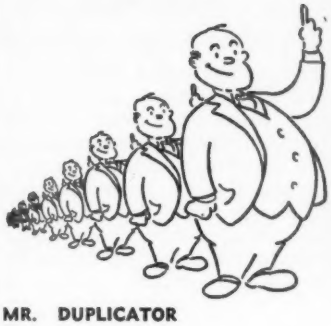
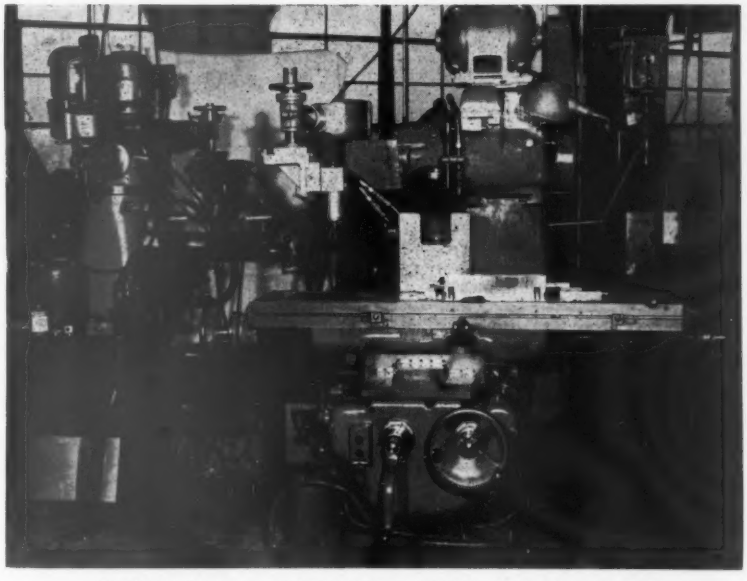


MR. DUPLICATOR



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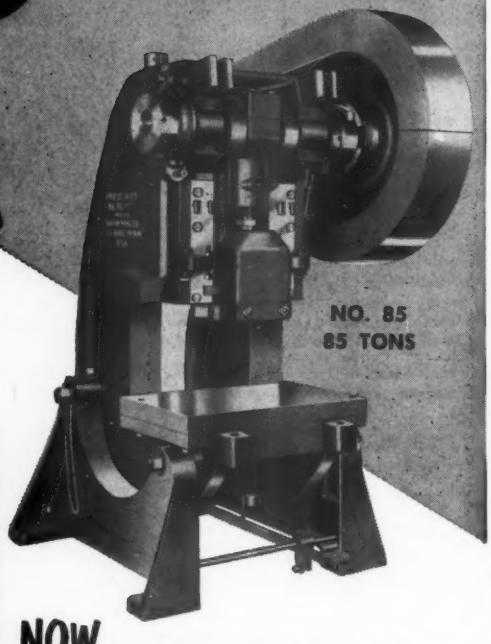

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Constructive Suggestion Improves Product

The Timken Roller Bearing Company produces a very high precision roller bearing, where extreme caution and care is used in the machining, heat treating, and finishing of the various parts of the bearing. Even microscopic flaws are guarded against so that the ultimate product is highly finished, accurate and precise.

One of the important parts of the tapered roller bearing is, of course, the roller itself. During the finish grinding of these rollers, they were dropped down the perforated chute (shown in Figure 1) into a receiving tray. Although there was only a drop of a few inches, the impact of one roller dropping on another would sometimes cause tiny nicks on the surface of the roller, barely visible to the naked eye. Harry Welsbacher, foreman, intent upon improving the product and decreasing the number of rejected parts, solved the problem of transferring the finished ground roller to the receiving tray without causing nicked or scratched surfaces in the following way:

Photos courtesy The Timkin Roller Bearing Company.

A spring pipe pictured in Figure 2, replaced the perforated steel chute. This spring pipe, the end of which is encased in leather to avoid nicking the rollers, is rotated in a small circle and at a slow speed around the bottom of the receiving tray.

FOR PRODUCT INFORMATION USE CONVENIENT INFORM-A-GRAM CARD

This rotary motion is achieved through the simple gear mechanism also pictured in Figure 2. By this new process, the roller is literally laid in the bottom of the receiving tray. Nicks in bearing rollers caused by the drop from

FIG. 2

the machine to the receiving tray have been eliminated, waste has been substantially reduced, and accuracy increased, thanks to Harry Welsbacher, foreman.

When the Timken Company was only twelve years old, and Welsbacher only sixteen years old, Harry Welsbacher started as a roller grinder. Over a period of seven and a half years, he has submitted twelve proposals for improvements, a noteworthy achievement in itself.

Welding Clamps

A manufacturer of workpiece positioners has announced a new line of magnetic welding clamps. These clamps have many uses,

Photos courtesy Aronson Machine Company

but their most important function is in the welding field. They are used to locate and hold pieces of metal together for tacking and welding. Some jobs would be to hold two flats together for butt welds, or to hold one piece at 90 degrees to another for filet

. . . *Continued on page 106*

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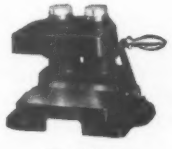
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Fig. 6—Rolls of coated abrasive stock for a drum sander are usually kept on vertical rack near the machine. No stock should be wasted after a roll is started with first taper cut as shown because successive cuts will leave the roll with proper leading angle.

by William T. Conway
Behr-Manning Corp.
TROY, N. Y.

How to Cut Spiral-Wound Abrasive Drum Covers

Several types of drum grinders that require spirally-wound coated abrasive drum covers are being used in the metal working industry for surface finishing flat wide sheets, and strip stock. When such drum covers are worn and ready for replacement, the new covers are commonly cut from rolled stock and installed by factory maintenance personnel or by the machine operator. Improper cutting of the cover often leads to waste or malfunctioning of the machine. By following the procedures outlined below, a minimum of coated abrasive stock will be lost and the new covers will fit their drum accurately.

Two separate procedures are offered because two basic types of spirally-wound drum machines are in use. On one type of machine the coated abrasive cover is butt-wrapped on a smooth drum. On the second type of machine, the abrasive cover is overlapped along the spiral. The drum on this type of machine has a spiral groove on its surface to allow for the double thickness of coated abrasive. On both types of machines the abrasive cover is clamped at both ends of the drum with a suitable take-up device to keep the cover snug on the drum surface.

Practically all of these drum sanders are designed to use 24-in. wide rolls of coated abrasive, either paper-, fiber-, or cloth-backed, or with combinations of these materials. Because the diameter and length of the drums vary according to manufacturer, the abrasive covers must be cut to fit the individual machine. Therefore, measurements must be made on the spot or from specifications written for the particu-

. . . *Continued on page 108*

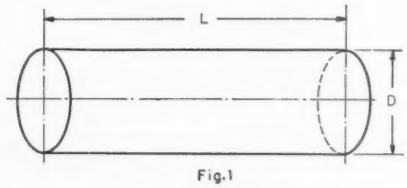

Fig. 1

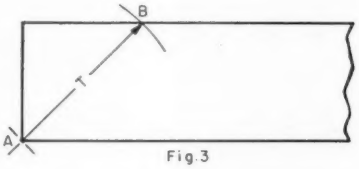

Fig. 3

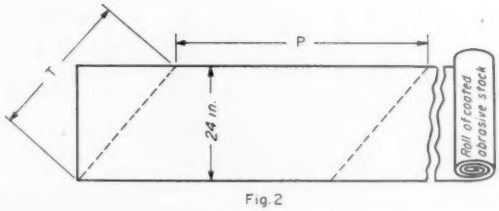

Fig. 2

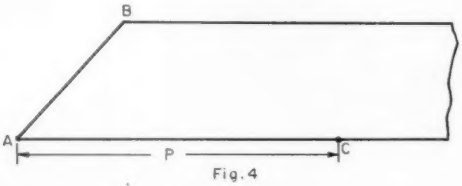

Fig. 4

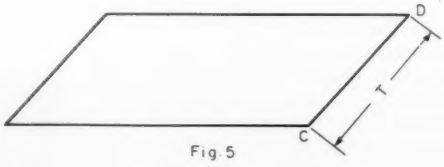

Fig. 5

Fig. 1 illustrates the basic drum dimensions of length and diameter while Fig. 2 shows the basic dimensions for the abrasive cover. Figs. 3, 4, and 5 show the elements which enter into the layout for cutting the abrasive cover.

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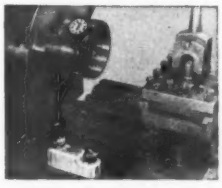

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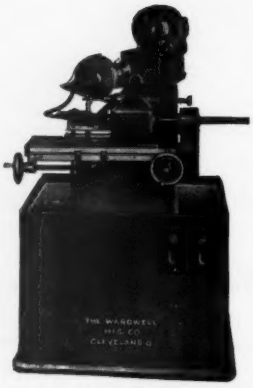

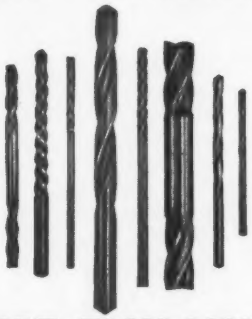

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welds or two odd size pieces for lap welds.

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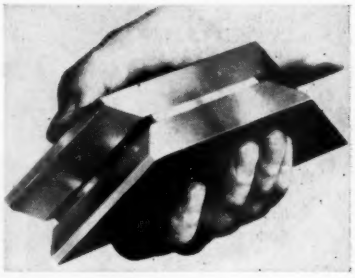

They are used to hold rounds to rounds, rounds to flats or flats to flats. The MCA is adjustable to any angle. It consists of one set with two magnets attached with a link on either side held with a thumb screw. They will hold light sheet metal at any angle for tacking and welding.

The magnetic cores are made of Alcomax, and since they are permanent, will be as good after many years of use as they were when purchased.

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. . . Clamps, from page 103

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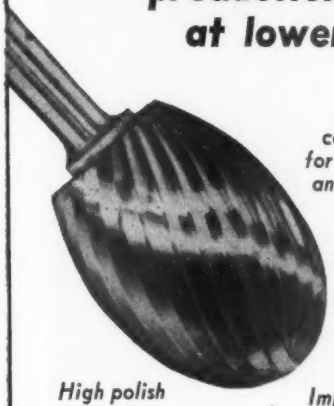

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. . . Abrasive Drum Covers, from page 104

Fig. 7—Above, Coated abrasive cover being spiral wound onto the cast iron roll. Note that the seams are butted together and are not overlapped.
Fig. 8—Right, Four clamps on each end of the grinding roll hold the coated abrasive cover in place. A rubber faced steel roll, directly under the grinding roll, backs up the work being ground and maintains the accuracy of its finished thickness.

lar model involved. Basic drum dimensions are length and diameter, as in Figure 1, and must be measured in inches. Basic dimensions for the coated abrasive cover are the length of the taper (T) and the length of the cover (P), in Figure 2; both dimensions will be determined in inches.

Butt - Wrapped Spiral Covers

(All Dimensions in inches)

(a) Calculated area of drum (A_D) to be covered.
A_D=length of drum (L) x diameter of drum (D) x 3.14

(b) Calculate length of abrasive cover (P)

$$P = \frac{\text{area of drum } (A_D)}{\text{width of coated abrasive } (24'')}$$

(c) Calculate length of angle cut or taper (T)

T = diameter of drum (D) x 3-.14

(d) Knowing the length of angle cut (T), scribe an arc with a string or rule of radius T from one corner (A) of the coated abrasive until it intersects the opposite edge (B) of the coated abrasive as shown in Figure 3. Cut the cover* on a straight line (AB) between the two points.

(e) Referring to Figure 4, measure off the calculated length of the cover (P) along the edge of the coated abrasive (AC).

(f) Repeat (d) scribing arc of radius T from point C on Figure 5 to locate point D. Cut straight line CD.

After initial cover has been cut from a roll of coated abrasive, each cover after that is cut by merely repeating steps (e) and (f).

Overlapped Spiral Covers

(a) Calculate theoretical circumference of drum (C_T) and length of angle cut or taper (T)
C_T=diameter of drum (D) x 3.14 width of overlap (measured parallel to edge of drum)

(b) Calculate area of drum (A_D) to be covered.
A_D=length of drum (L) x theoretical circumference (C_T)

(c) Calculate length of abrasive cover (P)

$$P = \frac{\text{area of drum } (A_D)}{\text{width of coated abrasive } (24'')}$$

(d) Knowing T and P, follow steps (d), (e) and (f) given previously for butt-wrapped covers.

*Note: Always cut covers from the back side of the coated abrasive. This results in less wear on edge of cutting knife.

Aluminum Pouring Ladle

A revolutionary crucible-ladle, with a coffee pot lip extending under the metal line, is enabling more efficient pouring of aluminum for vital jet engine housing castings.

This announcement was made by engineers of the Electro Refractories & Abrasives Corp. here and Bohn Aluminum & Brass Corp., Detroit, Mich., jointly responsible for the development. The odd-shaped spout is believed the first to be successfully joined to a carbon-bonded silicon carbide ladle below the metal line. Making the lip as an integral part required development of a new manufacturing technique at Electro.

Previously, with conventional ladles, aluminum temperature drops caused "cold shots" and defective castings. The new ladle is actually a self-contained tilting furnace. It has a steel shell with a refractory lining and a gas-fired combustion area to accommodate a crucible holding 125 pounds of aluminum. The coffee pot lip pours a constant stream more rapidly and eliminates spillage. Sound castings are assured by constantly maintaining the aluminum to be poured at about 1385 degrees F.

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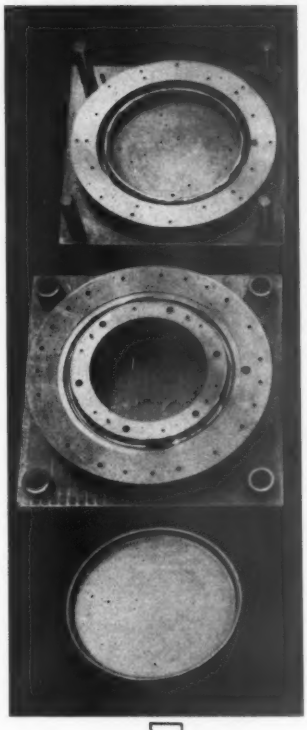

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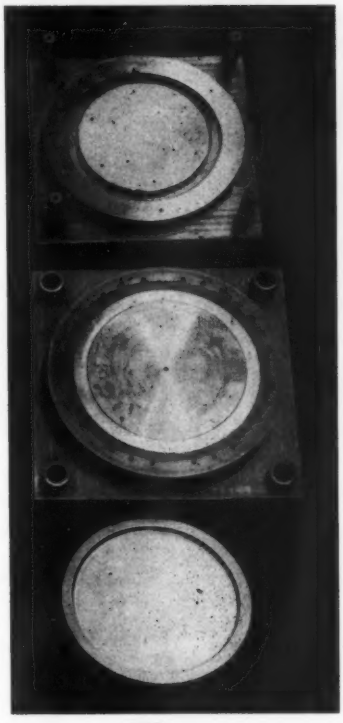

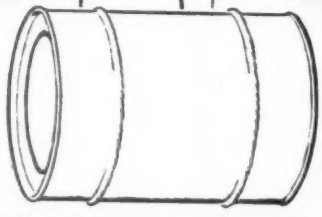

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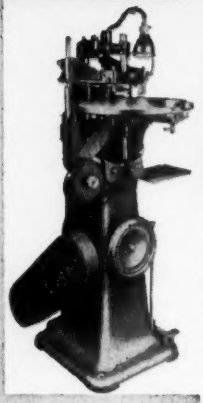
OLIVER OF ADRIAN



Oliver Die Makers have been cutting costs for 40 years, saving toolrooms up to 60% and better in time and expense over hand methods of making dies. In thousands of plants throughout the world Oliver Die Makers are meeting production demands, giving long-lasting service (many Olivers have been in continuous use for more than 30 years), speedily, accurately, dependably. Skilled labor is not required on an Oliver due to the simplicity of operation. Modernize your die making methods the cost-cutting Oliver Way . . . Be Wise, OLIVERize.

OLIVER DIE MAKERS
Available in 5 Models

The Bench Model S-1 (illustrated) is a single speed die maker for use on tool steel up to 1" thick.

The Heavy Duty Model (illustrated) has 6 speeds, works in metal up to 3" thick, has variable strokes to 5" with hydraulic feed.

Write Today For Complete Technical Data on OLIVER DIE MAKERS

See our catalog in Sweet's Directory

MACHINE TOOLS by OLIVER include:
AUTOMATIC DRILL GRINDERS
TOOL & CUTTER GRINDERS
DRILL POINT THINNERS
TEMPLATE TOOL GRINDERS
FACE MILL GRINDERS
DIE MAKING MACHINES

OLIVER INSTRUMENT CO.
1676 E. MAUMEE · ADRIAN, MICHIGAN

Checking Critical Dimensions on Jet Blades

An air gage assembly that is used to check critical dimensions on a jet engine turbine bucket blade simultaneously is a recent development of an Ohio manufacturer. In one quick step an unskilled operator can check blade taper in relation to root

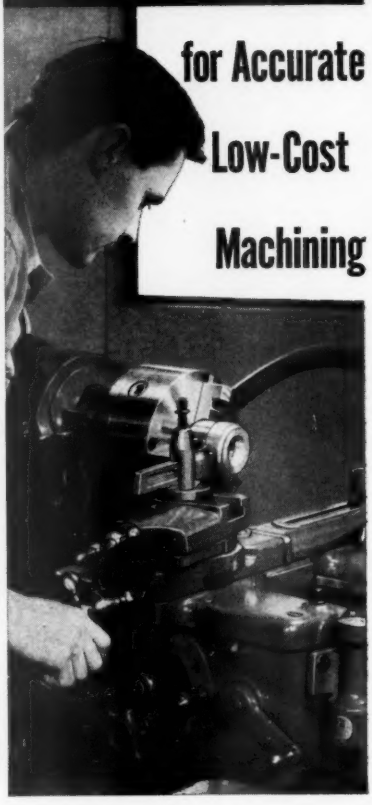
Photo courtesy The Sheffield Corp.

form at three places along the leading and trailing edges and measure the length of the root form. The accuracy of each dimension is indicated by the position of floats in a seven column Precisionaire.

This multiple gaging assembly consists of a blade positioning fixture on which are arranged seven "Plunjet" gaging cartridges, and a seven column Precisionaire. The relative position between the "Plunjet" at the root form and those along one edge of the blade, is always the same since these gaging cartridges are positioned in a floating arm. Thus, a variation in root length, as long as it is within tolerance, does not prevent accurate inspection of taper.

Each "Plunjet" gaging cartridge has its own glass column and indicating float—a feature which shows instantly whether each dimension is acceptable or has a plus or minus condition. Close grouping of the columns and the upper and lower limit tolerance markers on the face of the glass tubes, permit single-focus panoramic viewing of all float positions at one time. No expensive minimum or maximum precision masters are required since a calibrated blade is used to position the floats.

SOUTH BEND
13" LATHES
for Accurate
Low-Cost
Machining



You can reduce costs in your shop by using equipment that will assure accurate and efficient production. Modern in design and built with extreme care, South Bend 13" Lathes are fast, accurate, and versatile. They have many improvements and refinements that will make your most difficult lathe jobs easier.

Write for complete information on South Bend Lathes, Drill Presses and Shapers.

SPECIFICATIONS

- Swing — 13⅛" over bed
- Center Distances — 16" to 52"
- Collet Capacity — 1"
- Spindle Speeds — (8), 40 to 940 r.p.m.
- Cross and Longitudinal Power Feeds — 48 each
- Thread Cutting — 48 R. H. or L. H. pitches . . . 4 to 224 per inch

SOUTH BEND LATHE
SOUTH BEND 22, INDIANA
Building Better Tools Since 1906

FOR PRODUCT INFORMATION USE CONVENIENT INFORM-A-GRAM CARD

Use KIPP AIR GRINDERS if you want to GRIND —not just rub!

MODEL JA
50,000 R.P.M.
$42.00
IN U.S.A.

Weight 12 ounces; length 6¾ inches; chuck size ⅛ inch. Wheel guard removed for better illustration.

The RPM's stay up while grinding . . . not only when the grinder runs idle.

It is an established fact that surface speeds must stay up to approximately a mile a minute if you want to grind—not just rub. Every mechanic knows this, but inexperienced buyer may order tools that maintain proper grinding speeds only when running idle. The speed of Kipp air grinders drops but slightly when put to work. That means better work—longer wheel life.

Buy Kipp air tools for best results, lower prices.

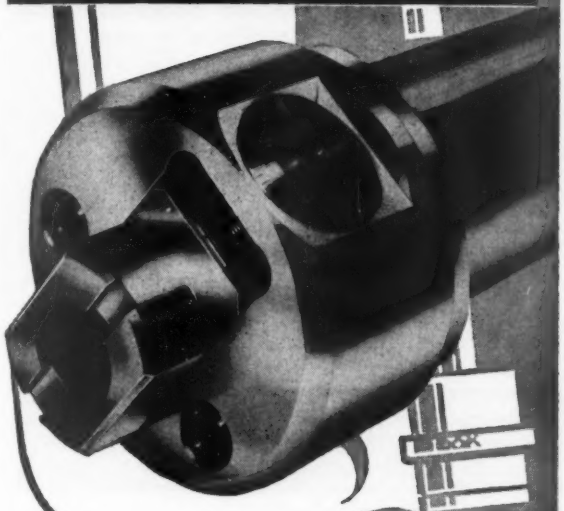
MADISON-KIPP CORP.
212 Waubesa St., Madison, Wis., U.S.A.

- Skilled in DIE CASTING Mechanics
- Experienced in LUBRICATION Engineering
- Originators of Really High Speed AIR TOOLS

JOB PROVEN!

SAMSON

offset BORING CHUCKS



precision built by precision toolmakers for accuracy and durability in service!

- Designed for quick tool change; equipped with new, extra large dial for precision radial adjustment; machined to provide positive dead centering for rigid, high production milling and boring without removal of chuck; available with a complete selection of interchangeable accessories—these are features that make the Samson Offset Boring Chuck the logical first-choice of the field.

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ALSO Distributors of famous LAST WORD WHEEL DRESSERS

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OR ROLL

Makes OLD floors NEW in minutes!

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MAGIC FLOOR stores indefinitely in container.

MAGIC FLOOR requires no drying time—traffic rolls in minutes after application—sustains loads up to 50,000 lbs.

Write today for information Bulletin F-161.

RANCO INDUSTRIAL PRODUCTS CORP.
Quality Floorings and Waterproofings for Industry
13311 Union Avenue - Cleveland 20, Ohio
Representatives in principal cities

Two P & W Leaders End Long Careers

The retirement of two veteran executives has been announced by Pratt & Whitney of West Hartford, Conn.

Charles M. Pond and Hubert D. Tanner, both vice presidents and directors of the Niles-Bement-Pond Co. subsidiary, have called it a day after serving the metalworking industry for a combined total of 83 years.

Mr. Pond has retired after being with P & W for half a century and Mr. Tanner has stepped down after 33 years of service with the firm.

Besides serving P & W for many years, Mr. Pond and Mr. Tanner rendered valuable services to both the metal working field in general and their country.

Mr. Pond served as chairman of the Committee on Standardization of Taps and Reamers for the American Standards Association and was a member of the Cut and Ground Thread Tap Advisory Board during World War II.

Mr. Tanner was responsible for the coordination of Pratt & Whitney's building expansion program with the requirements of the company's war production effort.

Mr. Pond began his career with P & W in 1903 after finishing his education at Columbia University's Mechanical Engineering School.

Mr. Tanner joined P & W in 1920 as a machine designer, specializing in the development of gear grinding and thread milling machines.

WE HAVEN'T SUNG NOTHING YET!!

We haven't sung nothing yet! The reduction of scrap, better holes for reaming and better-reamed holes, better assembly, longer drill and reamer life, reduction of your bushing inventory. We have told you of direct savings up to 90%, and the savings of time in the less-frequent changing of bushings.

★ **YOU CAN AFFORD GOOD DRILLING!**

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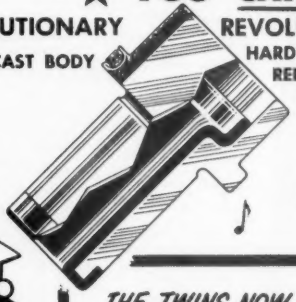
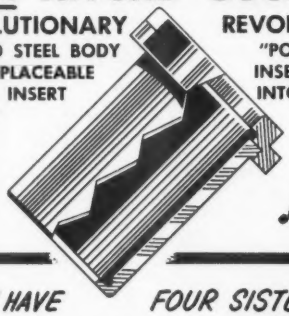
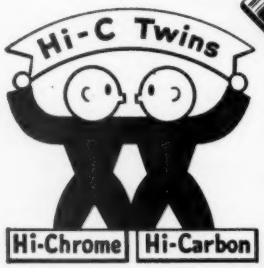


REVOLUTIONARY HARD STEEL BODY REPLACEABLE INSERT



REVOLUTIONARY "POP FIT" COIL INSERT DIRECTLY INTO JIG PLATE



THE TWINS NOW HAVE FOUR SISTERS . . .

SOLID AREAS INDICATE LOCATION OF NYLON

REVERE BEARINGS FOR MACHINERY AND AUTOMOTIVE USE

Revere Fisher ENGINEERING COMPANY NORTH BRANCH MICHIGAN

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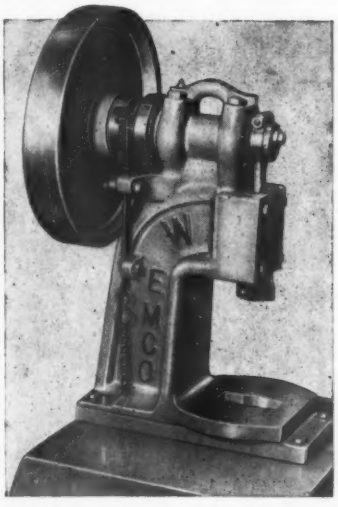


Emco "W", bench type. Also Emco "X" (larger size). Both sizes also stand-mounted. With or without motor drive.

EMCO

POWER PUNCH PRESSES are SPEEDY and SAFE

Versatile Emco "W" and "X" presses excel for punching, forming, stencilling and riveting metal, rubber, leather, plastics and other non-metallic materials. You get up to 300 operations per minute. Profit from big machine speed, strength, rigidity, accuracy and endurance. Compact, fool-proof (non-repeating), simple design—easy to understand and operate. Thousands of Emcos in money-making use testify to Klaas' dependability since 1921.

Two Practical Sizes

Emco "W"—¾" 1" and 1¼" standard stroke
Emco "X"—1½" and 2" standard stroke
Specials to order

★ ★ ★

Write on your letterhead for our Bulletin "T-8"

UNUSUAL AIDS TO INDUSTRY

THE KLAAS MACHINE & MFG. COMPANY
4312 East 49th Street
Cleveland 25, Ohio

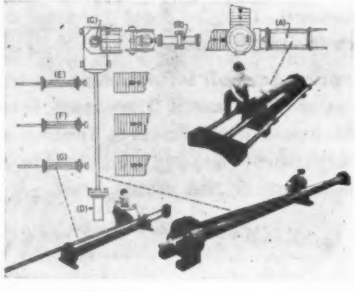
KLAAS-BUILT

Conveyor Moving Heavy Material by Hydraulics

A coil handling equipment conveyor at the U. S. Steel Sheet & Tin Mill in Gary, Indiana, is illustrative of the growing role that fluid power is paying in the movement of heavy materials efficiently and economically. Large, heavy coils of sheet steel are pushed, tilted, lifted and pulled down a conveyor line by means of 7 special, long stroke air and hydraulic cylinders for final positioning of three gravity conveyors leading to the entry end of the pickle lines. The coils range in size from a minimum of 30" diameter by 2' high to 4'-6" diameter by 6'-2" high and weigh up to 25,000 lbs. maximum.

Photos courtesy Lindberg Engineering Co.

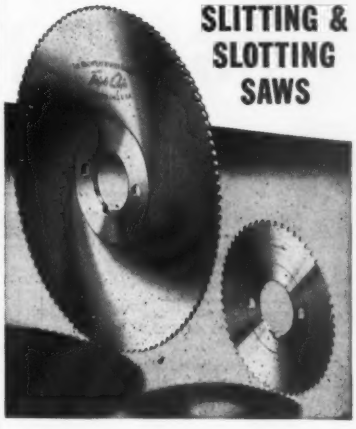
Cranes lift the coils from the storage area in the raw coil pickling department and position them upright on a powered conveyor leading to a turn table. Due to the varying sizes of the coils, an operator turns the table until the coil fits snugly against the pusher head of a mill type air cylinder (A) with a 16" bore x 72" stroke. This cylinder pushes the coil on to a powered



. . .Continued on page 151

NO CLOGGING— NO BINDING—

with MOTCH & MERRYWEATHER Triple-Chip SLITTING & SLOTTING SAWS



The Motch & Merryweather Triple-Chip Method clears the way to faster results in milling operations. Alternately ground paired high and low blade teeth form curling, self-clearing chips which relieve stresses and minimize breakage. Saws produce more work and more accurate work and "live longer".

★ ★ ★

DUAL DRIVE..

for More Power to Your Blades!

Dual Drive is available on all M. & M. slitting saws.

Motch & Merry eather Dual Drive construction makes keyways unnecessary. Two pins drive the saw blade and eliminate stresses at the drive point. The Dual Drive adaptor is keyed to the arbor, thus permitting a wide interchangeability in saws.

★ ★ ★

THE MOTCH & MERRYWEATHER MACHINERY CO.
715 PENTON BUILDING
CLEVELAND 13, OHIO

Triple-Chip METHOD

REMEMBER—IT'S THE COST PER CUT THAT COUNTS!

ALL 3:

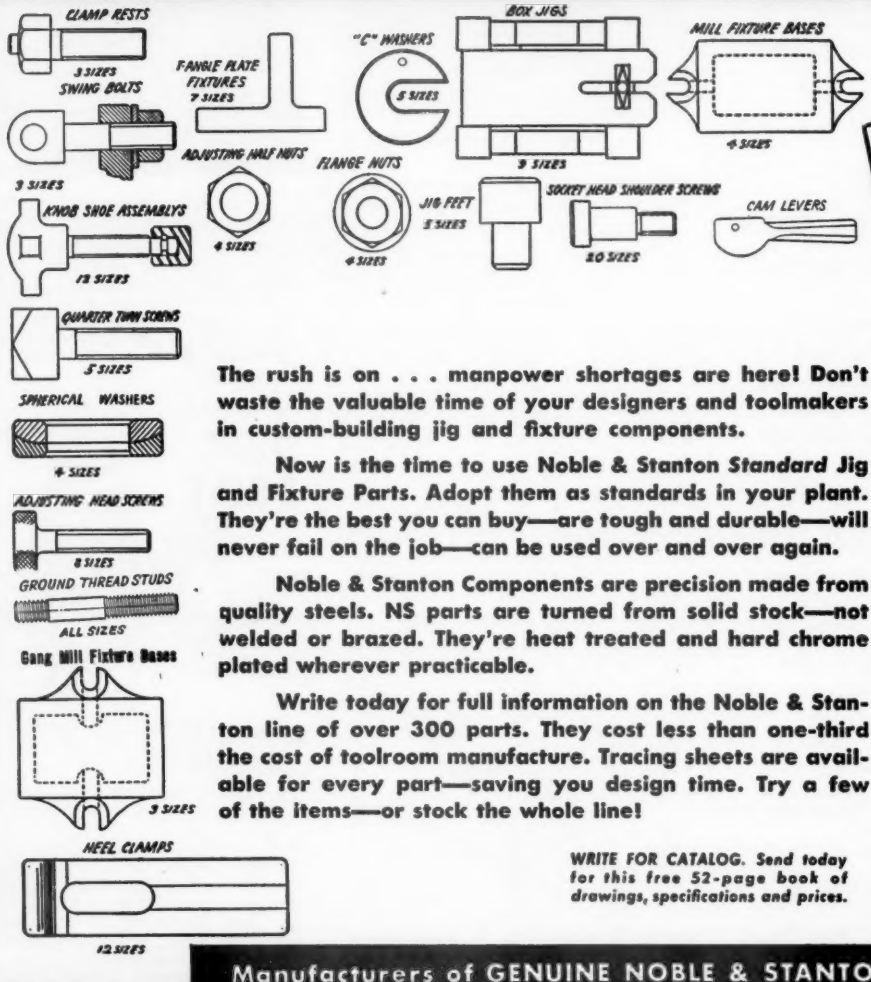
NOBLE & STANTON *Standards*

The Quality Line JIG and FIXTURE PARTS

SAVE MAN-HOURS

- Cut Designers Time
- Cut Toolroom Costs

OVER 300 COMPONENTS AVAILABLE AT ONE-THIRD THE COST OF CUSTOM-MAKING



NEW 1953 Standards NOW AVAILABLE

The rush is on . . . manpower shortages are here! Don't waste the valuable time of your designers and toolmakers in custom-building jig and fixture components.

Now is the time to use Noble & Stanton *Standard* Jig and Fixture Parts. Adopt them as standards in your plant. They're the best you can buy—are tough and durable—will never fail on the job—can be used over and over again.

Noble & Stanton Components are precision made from quality steels. NS parts are turned from solid stock—not welded or brazed. They're heat treated and hard chrome plated wherever practicable.

Write today for full information on the Noble & Stanton line of over 300 parts. They cost less than one-third the cost of toolroom manufacture. Tracing sheets are available for every part—saving you design time. Try a few of the items—or stock the whole line!

Ask for your copy of OUR NEW CATALOG

***WRITE FOR CATALOG.** Send today for this free 52-page book of drawings, specifications and prices.*

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2	17	32	68	82.2	92	107A	118C	128D	135A	139A	144B	148E	151D	154C
3	18	33	69	82.3	93	107B	118D	130A	135B	139B	144C	149	152A	155
4	19	34	70	82.4	94	109	120A	130B	136A	140A	144D	150A	152B	157
5	20	36	72	82.5	95	110A	120B	130C	136B	140B	144E	150B	152C	158
6	21	37	73	82.6A	96	110B	120C	131A	136C	140C	145	150C	152D	
7	22	38	74	82.6B	97	111A	120D	131B	137A	140D	146A	150D	152E	
8	23	57	75	83	98	111B	123A	132A	137B	141A	146B	150E	152F	
9	24	59	76	84	99	112A	123B	132B	137C	141B	146C	150F	152G	
10	25	61	77	85	100	112B	125A	132C	137D	141C	146D	150G	152H	
11	26	62	78	86	101	113A	125B	133A	138A	141D	147A	150H	153A	
12	27	63	79	87	102	113B	127A	133B	138B	142A	147B	150J	153B	
13	28	64	80	88	103	114	127B	134A	138C	142B	148A	150K	153C	
14	29	65	81	89	105	117	128A	134B	138D	143A	148B	151A	153D	
15	30	66	82	90	106A	118A	128B	134C	138E	143B	148C	151B	154A	

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3	18	33	69	82.3	93	107B	118D	130A	135B	139B	144C	149	152A	155
4	19	34	70	82.4	94	109	120A	130B	136A	140A	144D	150A	152B	157
5	20	36	72	82.5	95	110A	120B	130C	136B	140B	144E	150B	152C	158
6	21	37	73	82.6A	96	110B	120C	131A	136C	140C	145	150C	152D	
7	22	38	74	82.6B	97	111A	120D	131B	137A	140D	146A	150D	152E	
8	23	57	75	83	98	111B	123A	132A	137B	141A	146B	150E	152F	
9	24	59	76	84	99	112A	123B	132B	137C	141B	146C	150F	152G	
10	25	61	77	85	100	112B	125A	132C	137D	141C	146D	150G	152H	
11	26	62	78	86	101	113A	125B	133A	138A	141D	147A	150H	153A	
12	27	63	79	87	102	113B	127A	133B	138B	142A	147B	150J	153B	
13	28	64	80	88	103	114	127B	134A	138C	142B	148A	150K	153C	
14	29	65	81	89	105	117	128A	134B	138D	143A	148B	151A	153D	
15	30	66	82	90	106A	118A	128B	134C	138E	143B	148C	151B	154A	

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A7	A20	A33	A46	B13	B26	B39	B52	B65	B78	C7	E11
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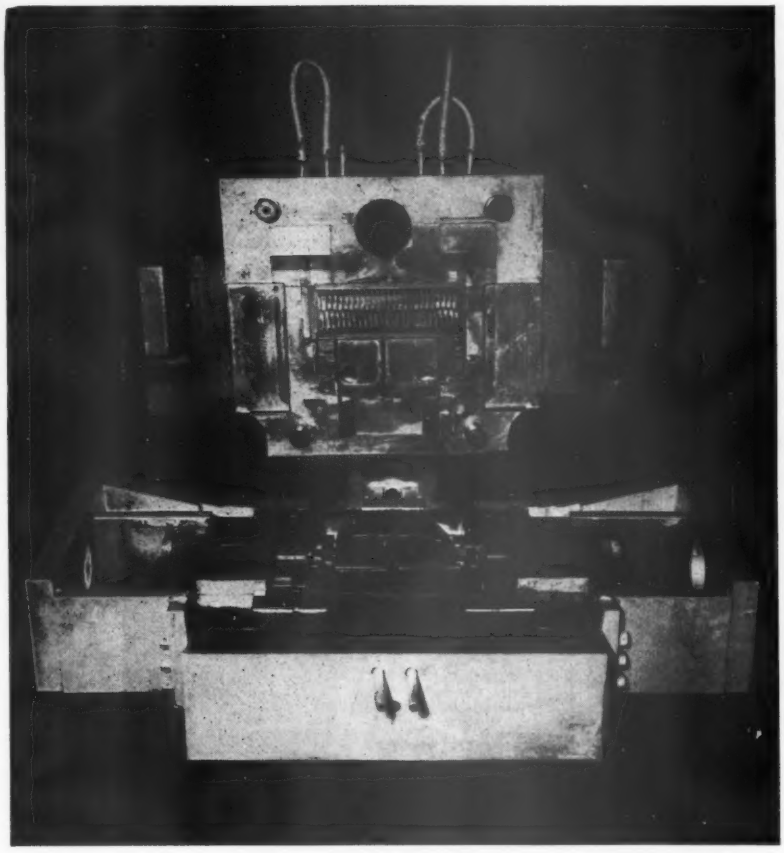

No matter what your DIE-CASTING JOB may be...

Accuracy calls for POTOMAC M Hot Work Die Steel

"HOT-WORK STEELS"

is the title of a new, six-page folder that tells about the chromium, molybdenum, vanadium Hot Die Steel known as POTOMAC M—and also covers other grades for other hot-work operations. Secure your copy *—write today!*

ADDRESS DEPT. TP-44

In the precision casting of aluminum, POTOMAC M Hot-Work Die Steel is especially favored as the material for die-casting dies because its properties help assure accuracy of the steel itself *after* heat treatment. Die makers have found that size changes are held to a minimum. Dimensional stability is thus the *first* contribution that POTOMAC M makes to accuracy.

Production accuracy of the die after it is in service is maintained also by the resistance of POTOMAC M to wear, to heat checking, and to metal wash.

Allegheny Ludlum makes a complete line of steels for hot-work tooling of various kinds—so, whether your need is the mass producing of duplicate parts or fabricating a few of them, call up or write "A-L" every time for hot-work counsel or service or both. Just tell us your requirements.

● *Allegheny Ludlum Steel Corporation, Henry W. Oliver Bldg., Pittsburgh 22, Pa.*

For complete **MODERN** Tooling, call

Allegheny Ludlum

WBD 3724

AL FINE TOOL STEELS SINCE 1854

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RING PUNCHES

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HARD...
tough . . .
concentric . . .

Precision-made of both Carbon Vanadium and high carbon, high chrome steels. Available in a wide range of stock sizes from 1/32" to 1" point diameters in increments of 1/64" for immediate delivery. Decimal sizes to order for delivery within 48 hrs.

Button Dies

Ring Type or Press Fit Hole tapered to eliminate slug jamming. Sizes in stock to match punch sizes.

Write TODAY for your copy of handy data sheets covering specifications and prices; also name of distributor in your area.

Exclusive Distributor Wanted for the States of Washington and Texas

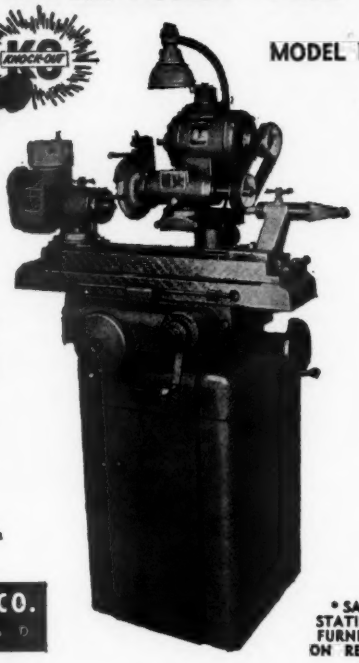
Ring Punch & Die Co.

108 FOOTE AVE., JAMESTOWN, N. Y.

There's a reason 76%*

of all popularly-priced Tool and Cutter Grinders sold in 1952 were *"Knock-Outs"*

MODEL B860



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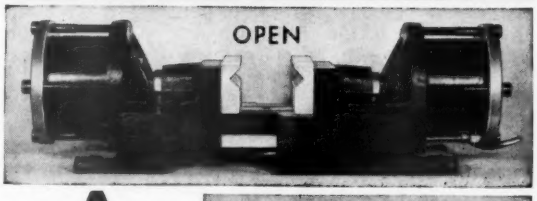

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In this bulletin, The Rivett 1020 Steelway Precision Toolroom Lathe, a product of Rivett Lathe & Grinder Inc., presents itself for your critical study. Specifications and photos are included.

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The range of Spiramatic jigmill precision boring and milling machines are described in a catalog now available from the DeVlieg Machine Co. Included is the jigmill design, and field of application.

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You do everything in one spot with the new 100-ton Alpha die tryout press. Alpha Tool Works explains in its latest literature how you can barber, shear, fit and finish without removing the die from the press.

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Many of the new features of the DoAll hydraulic surface grinder are presented in a new brightly illustrated brochure. Among the new advantages pointed out are the improved "cool grinding" operation.

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ENGINEERING TOOLS

Standardization is discussed by men from trade associations and companies in a booklet on the recent proceedings of the Third National Standardization Conference. Booklet, published by the American Standards Association, 70 E. 45th St., New York 17, N.Y., includes papers presented and sells for $2.

V-BELTS

This catalog contains charts and tables of interest to those concerned with V-belt transmission. Of considerable importance are the horsepower ratings submitted by the Rubber Mfg. Association. Booklet printed by Durkee-Atwood Co.

Circle Inform-A-Gram No. E10

RADIAL DRILLS

A new illustrated 16-page booklet featuring Morris 11" column MorSpeed Radial Drills has been published by the Morris Tool Co. The folder also supplies foundation plans, dimensions and specifications.

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METAL TUBING

Titeflex helically-wound flexible metal hose and Uniflex helically corrugated flexible metal hose are illustrated and described in a new catalog published by Titeflex, Inc. Engineering section contains installation data.

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CAM AUTOMATICS

New literature on the Motch & Merryweather single-spindle Cam Automatic for shell production gives an idea of the vesatility of this machine under the most demanding conditions.

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PRESS EQUIPMENT

Included in this Quick-Pic Catalog is detailed information on these Durant Tool Supply Co., press equipment accessories: Roll feeds, Stock reels, coil cradles, stock oilers, foot presses press guards and slide feeds.

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CHUCKING GRINDERS

Vertical chucking grinders, available in six sizes, are presented by the Bullard Co., in the firm's latest well-illustrated and comprehensive bulletin. Drawings and specifications of the machines are included.

Circle Inform-A-Gram No. E15

SEE ADVERTISERS INDEX, BACK OF BOOK, FOR INFORM-A-GRAM KEY NUMBERS

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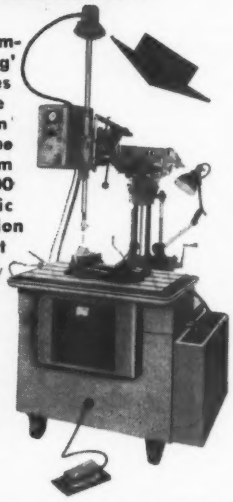

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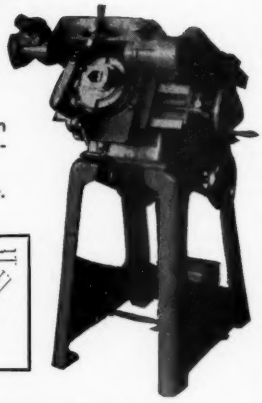

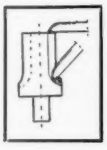

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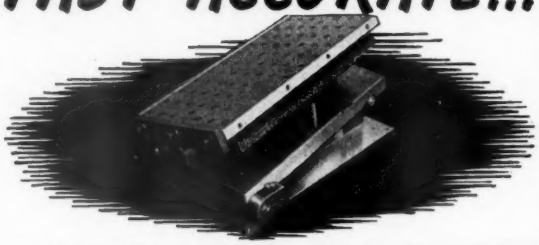

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TRACING TEMPLATE

A tracing template for jig and fixture components that covers 263 items in full scale on a single sheet 11″ x 25″ folded in two places to

measure 8½″x11″ has been designed by the Northwest Tool & Engineering Co., Dayton 3, Ohio. Tool designers will like this condensed template because it eliminates paging through bulky sheets and catalog for suitable standard tools and it is so handy to use.

The template is white on a black background to relieve eye strain and eliminate "missed" lines and contours in tracing.

Circle Inform-A-Gram No. C1.

"Corrosion Resistance of Copper and Copper Alloys", the first publication of its kind in the industry, explains the chemical and physical nature of corrosive attack in its various forms. In a revised edition, by the American Brass Co., Waterbury 20, Conn., more complete information has been added on stress-corrosion cracking, galvanic corrosion. fresh and water corrosion.

Circle Inform-A-Gram No. C2.

The Bearing Maintenance Report, published by the Anti-Friction Bearing Distributors Association, 1900 Euclid Ave., Cleveland 15, Ohio, is again being offered to men within the industry. The Maintenance Report will in the future, bring the answers to many problems of bearing service.

Circle Inform-A-Gram No. C3.

Welding and Metallurgical Aspects of stainless steel are well-described in a new 8-page publication by the General Electric Co., Schenectady 5, N. Y. The booklet covers three classifications of stainless steels: martensitic. ferritic and austenitic.

Circle Inform-A-Gram No. C4.

MEASURING INSTRUMENTS

A Handsome 37-page illustrated catalog on Etalon Swiss-made stainless steel measuring instruments has been prepared by an importer of the

foreign tools. The book includes detailed instructions on measurement with the vernier caliper and a handy chart showing decimal and millimeter equivalents for fractional parts of an inch. For copies or further information write Alina Corp.. 401 Broadway, New York 13. New York.

Circle Inform-A-Gram No. C5.

Titanium Alloys have their own unique machining characteristics. This factor has prompted Mallory-Sharon Titanium Corp. of Niles, Ohio, to publish a booklet, "Preliminary Machining Recommendations for Titanium". Titanium users should find these detailed suggestions about recommended tools, tool angles, cutting speeds, cutting fluids, etc., extremely helpful. Recommendations cover turning, milling, drilling, tapping, grinding and internal grinding, abrasive and hack sawing and reaming. The recommendations apply particularly to Alloy MST 3A1-5Cr, the highest strength titanium-base alloy now in production.

Circle Inform-A-Gram No. C6.

Pertinent Information relative to Eureka Tool and Die Welding Electrodes and rods and outlined procedures for metallic arc, oxy-acetylene and atomic-hydrogen welding of tools and dies are included in this 108 page pocket - sized booklet printed by the Welding Equipment & Supply Co.. 223 Leib St., Detroit 7, Mich. A section is also devoted to forge shop maintenance welding.

Circle Inform-A-Gram No. C7.

National Research Corp., 70 Memorial Dr., Cambridge, Mass., offers reprints of a recent article, "Economical Finishing with Vacuum Metallurgy", describing the use of the vacuum metallizing process in manufacturing both plastic and metal parts. All factors in determining the application of this process to specific finishing and coating problems are discussed.

Circle Inform-A-Gram No. C8.

Engineering Data on Thread and Form Rolling. Contained in this booklet is comprehensive technical information prepared by the Reed Rolled Thread Die Co., Worcester, Mass. Included in the publication are the advantages and application of rolled thread, equipment and tool needs, rollability of materials and blank specifications. Price of the booklet is $1.

WELDING ALUMINUM

Any engineer familiar with the welding of the older metals will find all he needs to know about welding, brazing and soldering aluminum in the new 186-page process, "Welding Aluminum", just published by Reynolds Metals Co., Louisville, Ky. This is a new and greatly enlarged edition of the manual by the same title originally published by Reynolds in 1946. The new edition contains material on 34 processes suitable for welding, brazing, and soldering aluminum and its alloys. It will be sent without charge to any engineer, designer, technical man or company executive requesting it on company letterhead. To others, the price is $1.00 per copy. Write Desk PR, Reynolds Metals Co., 2500 South Third Street, Louisville 1, Kentucky.

. . . Automation from page 47

in unreliable, and consequently, unsafe working conditions.

We recognize that any moving part will eventually fail. This is also true of the automatic loading devices. In order to protect the machine from "out of cycle" loading and consequent damage, a mechanical stop should be provided which would prevent the loading device from transferring parts into the machine proper.

by them on machinery. Some machine tool builders have taken a very significant step in this direction by providing pilot light panels (Fig. 12) for the purpose of visually detecting faults.

This method pinpoints the trouble and eliminates the necessity of inspection in hazardous places which are not faulty.

Safety stops are becoming increasingly more important as the size of machines increases. Some-

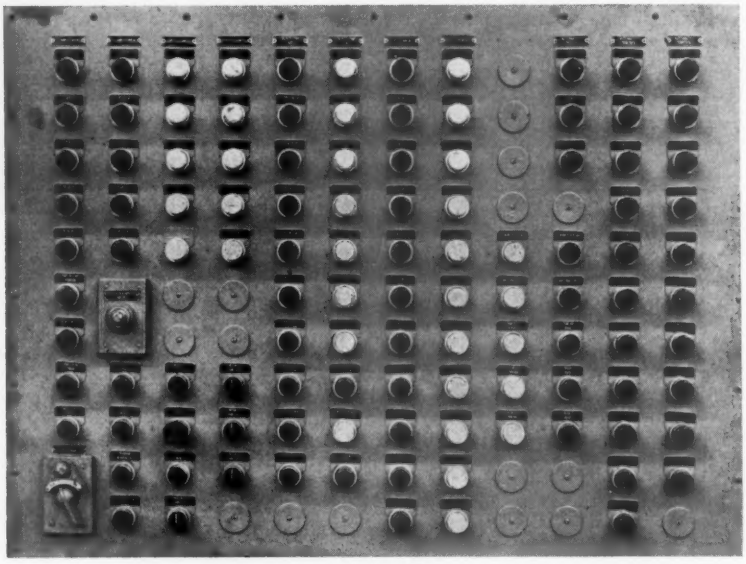


FIGURE 12

When machines are automatically loaded, the cycle is started by a limit switch, which is tripped by a properly located part in the load station. It is necessary that the machine complete its cycle with this one initiation. Therefore, cycles requiring push buttons to be operated at various stages of the cycle are not recommended.

Since the cycle starting of the machine is automatic under these conditions, we must avoid false starting. A separate relay should be used for cycle starting which will be de-energized by the emergency return button, emergency stop button, and hand operation of both machine and loading device. This will prevent automatic re-starting in the event of trouble and will protect the operating personnel from serious injury and the machine from damage.

The most effective method of preventing injury to maintenance personnel would be to eliminate machine failure. At the present time this is not possible, but we can reduce the amount of time spent

times a safety cable runs the length of the machine having one end fastened to a safety stop limit switch (Fig. 7, Det. 2). A person may then stop the machine quickly from any location around the machine, preventing damage or injury.

General Safety Provisions

There are many hazardous conditions on machines which are best safeguarded by the electrical engineer.

Hinged door compartments containing moving parts, such as belts, gears, etc., should be held closed by screws or bolts, not latches, and they should be electrically interlocked to stop all movement of gears and belts when the door is opened while machine is running. This is accomplished through the use of a limit switch mounted so as to be actuated when the door is properly closed (Fig. 13, Det. 1). Our safety department has required such safety interlocking for many years and is very strict in the enforcement of it.

Bolts or screws discourage the use of these compartments as storage space for lunches, aprons, tools, etc. We prefer bolted covers on all openings which do not have to be serviced at frequent intervals. These covers need no electrical interlocking.

The proper guarding of motor couplings, belts, and chain drives as well as exposed gears presents a problem to which most machinery builders give little attention. Many a finger or hand has been lost because these moving parts have not been properly guarded. We have spent large sums of money and man-hours to make and install proper guards on these machines before we could start production.

All guards should completely enclose the moving parts and prohibit the entrance of foreign bodies which could be injured or which could damage the moving members. A guard open on any side is not considered totally enclosed or safe. Guards mounted so as to use the side of a machine as one enclosing surface are considered safe providing they complete the total enclosing of the moving members. The horizontally split type guard is very good on many applications. The machine tool builders should design and install proper guards on all machines before shipping to the purchaser.

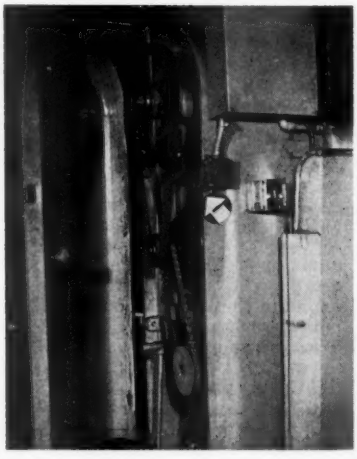
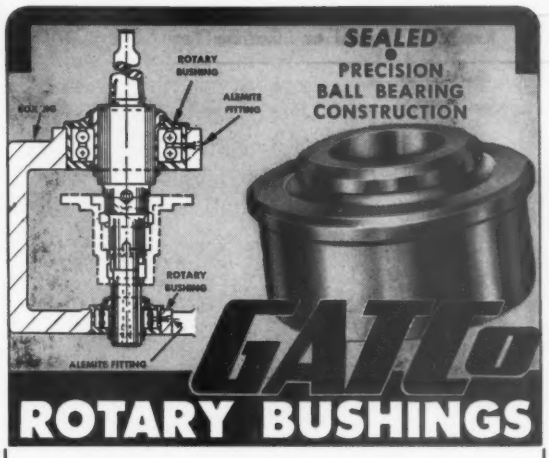


FIGURE 13

The hazard of shearing or squeezing is more prominent with the development of the large transfer-type machines. Electrically, the motors, push button boxes, and limit switches are usually involved. An example of this is in a self-contained head. Often a push

. . . Continued on page 124



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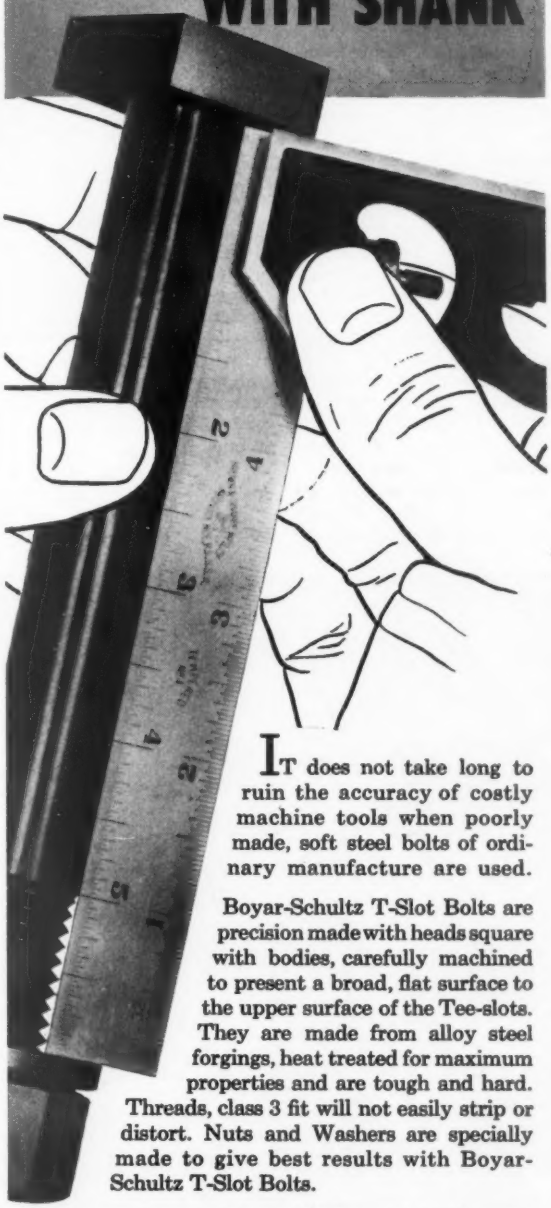

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Write for Free Catalog

BOYAR-SCHULTZ CORPORATION

2112 Walnut Street Chicago 12, Illinois

. . . Automation, from page 122

button box is mounted on the base of the head (Fig. 14, Det. 1), and it is so close to the movable head there isn't safe clearance between it and the junction box (Fig. 14, Det. 2) on the motor when the motor travels in and out. This danger applies not only to the mounting of electrical equipment, but also to the general layout of the machine. Shearing and squeezing hazards that result from one part of the machine passing in close proximity to another part of the machine must be suitably guarded.

Many machines are being built with multiple units complete with individual control panels (Fig. 15, Det. 1). On arrangements of this kind, a repair man would be required to lock out all units, sometimes requiring six or more locks, which usually are not readily available. To correct this condition, we are requesting the machine builders to install one master disconnect switch (Fig. 15, Det. 2), which would disconnect all power at one location on the machine.

One feature which we desire, besides the door interlock and being able to padlock the switch in the "off" position, is that of visible blades. Testers of various kinds are commonly used to determine if each leg of the circuit is open and safe to work on. These testers do not "fail safe" and for this reason the additional safety factor of visible blades is preferred.

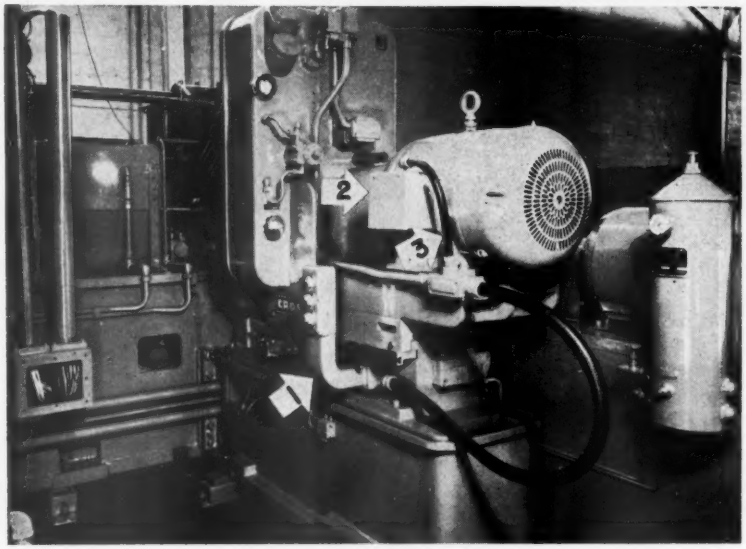

FIGURE 14

The application and mounting of limit switches is most important. All limit switches should be mounted so that any over-travel will not damage them. They should be operated in the manner for which they were designed. In lever operated applications, the actuator should approach from the side and pass over (Fig. 16, Det. 1). End-on approaches cause undue strain on the switch, often resulting in broken levers and faulty operation. Switches should be located so chips will not pile on them and cause faulty operation of the machine (Fig. 17, Det. 1).

We recommend that a short piece of oil-tight, flexible, metallic conduit with proper fittings be used in piping limit switches, solenoid valves, motors, and all electrical units which may have to be replaced. Present JIC Standards specify rigid piping. A short piece of flexible oil-tight conduit facilitates easier removal of units for inspection, repair or replacement, thus reducing downtime.

It is a strict safety practice that all 440-volt wiring on machine tools must be in rigid, or flexible metallic conduit, or proper metallic enclosures, such as buss or race ways. 440 volts should not be in super-service cord or any other form not containing full metallic protection as afforded in conduit.

All wiring ways (Fig. 15, Det. 3), whether rigid or flexible conduit, or wiring ducts must be properly assembled and sealed to protect

FIGURE 15

. . . Continued on page 126

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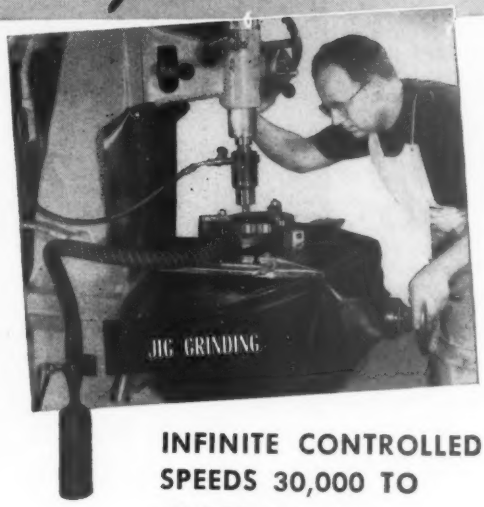

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Easily connect jig grinder to jig borer or mill

Then you can finish grind in hardened steel to "tenths" . . . jig grind dowel holes square with a ground base . . . move location of holes in hardened steel blocks . . . jig grind interchangeable holes in hardened sections . . . grind small holes with diamond impregnated mandrels . . . grind contours and relief with tungsten carbide burrs . . . grind radii in die sections . . . eliminate jig bushings in tools where close spacing is essential.

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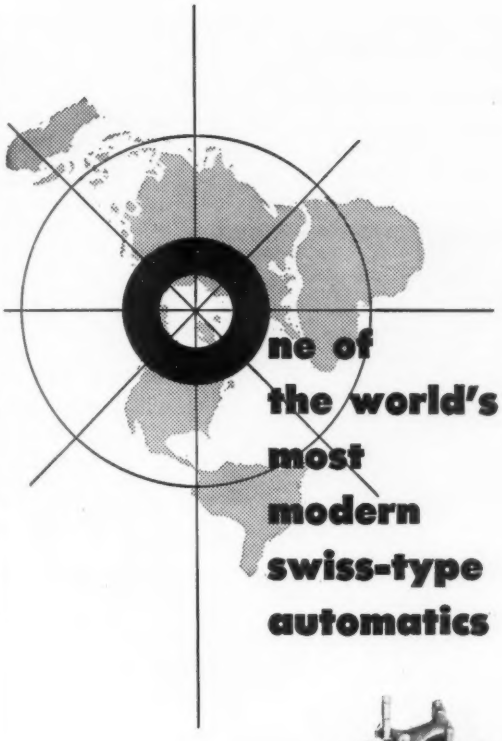

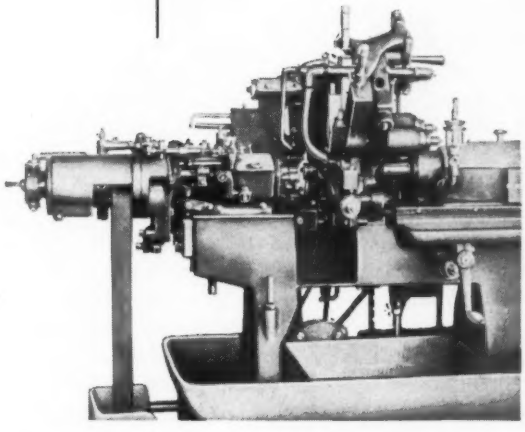

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. . . Automation, from page 124

both power and control wiring from all contaminants which are considered safety hazards.

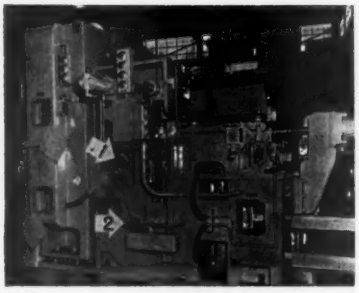


FIGURE 16

All rough corners and sharp bends shall be guarded to protect the wiring from mechanical damage which will cause electrical failure. We have received many machines using overhead wiring duct and not one of them has protected the sharp corners. This has necessitated our replacement of many wires which were skinned in the disassembly, or reassembly, of the machines.

Electrical components such as limit switches, solenoid valves, etc., should not be mounted in positions where they can be used for ladders, or pry posts. If necessary to mount these components in locations where such abuse is possible, suitable guards (Fig. 16, Det. 2) should be installed to prevent damage to them.

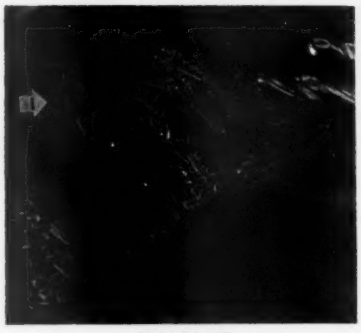


FIGURE 17

In closing, it should be pointed out that it is not only necessary for a machine to operate properly but it should be impossible for it to be operated improperly.

REMEMBER, THERE IS NO SUBSTITUTE FOR SAFETY

Cold Reducing of 18-Inch Tube

A giant compression method tube reducing machine now under construction for Tube Reducing Corporation of Wallington, N. J. will increase by several fold the size of tubes that may be cold sized by this unique process. The new machine will process in-going tubes up to 18″ O. D. The largest unit in present use takes an in-going tube of 6½″ O. D.

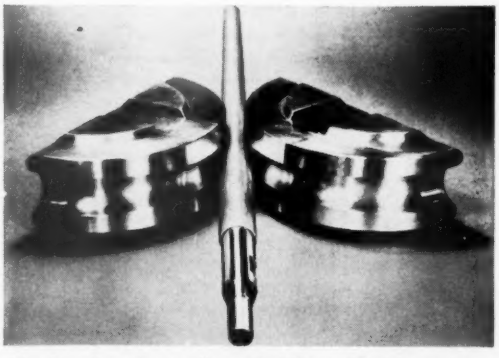
The new machine will be over 100′ long, and will use dies weighing over 7500 lbs. each. It will produce precision seamless tubing ranging in size up to 17″ diameter, with walls as light or lighter than 0.125″ in 10″ tubing, 0.175″ in 14″ tubing, and 0.200″ in 16″ tubing.

Processing of dies starts at the Midvale Co. shop with an ingot (No. 1 roll steel) weighing close to 20,000 lbs. This is machined down to about 15,000 lbs. before splitting. First step is rough turning the O. D. on a Bullard. Groove is rough turned to minimum diameter and flat faces machined. After being split longitudinally (with circular saw that takes a 1″ cut across diameter), dies are ready for shipment.

When received by Tube Reducing Corp., the dies are re-machined on the centerline and side faces with a Hydrotel horizontal miller, and the keyway cut. The next step presents a tough machining problem because the groove in the die must now be tapered, using the Hydrotel. The die is then heat-treated to a hardness of 55-60 Rockwell C.

All flat surfaces are finish ground on a Mattison surface grinder, specially constructed with high clearance under wheel and wall guard that allows the wheel to drop down in the keyway. Final step is grinding the outside diameter and finishing the tapered groove on the Hydrotel machine. The finished die has 31″ die face width and 50″ diameter.

The compression forming method can cold size tubing made from alloys which are difficult, if not impossible, to cold draw. Some of the high temperature resistant materials containing high nickel and cobalt have been successfully processed. Titanium tubing, somewhat difficult to cold draw because of its tendency to seize or gall, has been reduced by the compression forming method without this difficulty because of relatively little motion between die and tube.



Steel rocker dies and mandrel for cold sizing tubes by compression forming in Rockrite machines. Present machines take in-going tubes up to 6½″ dia.; the machine now under construction will take in-going tubes up to 18″ dia.

YESTERDAY'S PIONEER · · · TODAY'S LEADER

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(Both are Stock Items)

● Look at this rugged 2″ diameter Weldon end mill with 4″ long flutes which made a 2½″ deep cut in a solid block of die steel—4140 steel heat treated to 260 Brinnell. The feed was 1½″ per minute, and the material was removed at a rate of 7½ cubic inches per minute.

This HEAVY DUTY Weldon end mill is held by a new-style end mill holder which bolts securely on to the nose of the milling machine spindle. The holder, located by a centering plug, is driven by two drive keys on the spindle nose. The 2″ diameter shanks of these heavy-duty end mills are securely held by two large hollow head screws.

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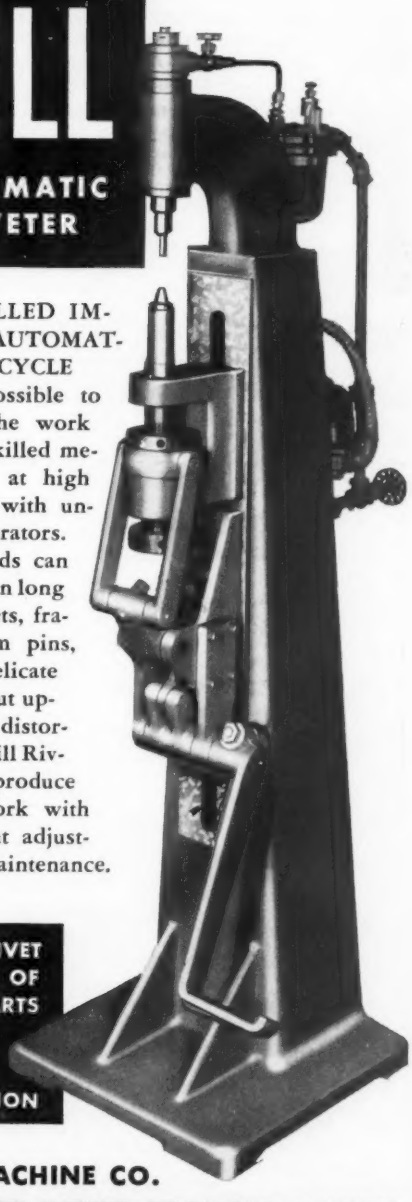

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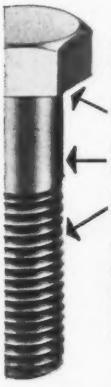

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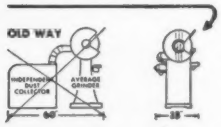

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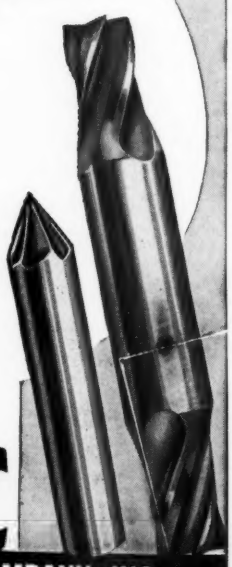

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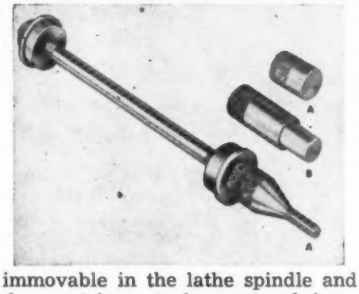
NEW DEVELOPMENTS • IMPROVEMENTS • COST AND TIME SAVERS — Mail FREE Inform-A-Gram Card for MORE Details

Faster and More Exact Work in the performing of secondary lathe operations is now possible as the result of a new Collet Stop, developed by the Wade Tool Company, Waltham, Mass. The new stop is held

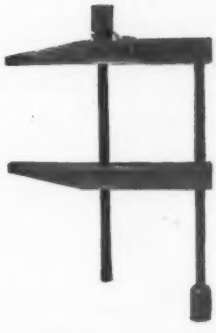


immovable in the lathe spindle and does not have to be removed from the collet or lathe during adjustments. Stop comes with solid pads (A) for different diameters of work and one spring pad (B) for use where it is desired to eject work as soon as the collet is released.
Circle Inform-A-Gram No A1.

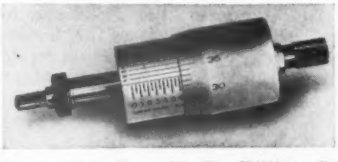
Gage Blocks manufactured by Webber Gage Co., 12900 Triskett Rd., Cleveland, Ohio, can now be combined into buildups that will serve as snap, ring or height gages,

calipers and scribers for dimensions under 12 inches. Use of the instruments is broadened by accessories offered by Webber that permit the gage blocks to be used as tools as well as standards of measurement.
Circle Inform-A-Gram No. A2.

Clamps Made To Facilitate Handling Tool and Die Trade Jobs that are extra tough are now available in 7 different sizes from the Precision Tool & Mfg. Co., S. Laramie Ave., Cicero 50, Ill. These case-hardened and "Mar-Tempered" parallel clamps are reported to be entirely different and the only ones of their type available on the market today. The clamps are heat-treated thruout and are built to stand hard use. They will make short work of jig, fixture and die assembly. The new extra large clamp illustrated at right will clamp up to a thickness of 9½" and to a throat depth of 5 inches.
Circle Inform-A-Gram No. A3.



The Tavannes Non-Rotating Spindle Micrometer Head made in Switzerland is being distributed in the United States by the Boeckler

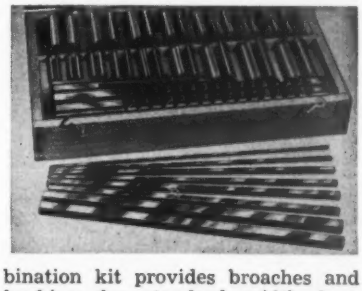


Instrument Co., 29 E. Rillito St., Tucson, Ariz. The head has a 1" range and reads vernier to .0001". It is now available for general mechanical and electronic applications.
Circle Inform-A-Gram No. A4

This Grip Vise is adaptable to all types of machine tools and is especially suited for short run production jobs. It provides even pres-

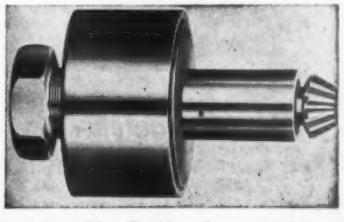
sure distribution to grip all contours of odd shaped pieces by means of gripping fingers which work independently. The unit is manufactured by the American Positive Grip Vise Corp., Olivine St., Williamsett, Mass.
Circle Inform-A-Gram No. A5.

To Meet a Widespread Demand for a keyway broach kit that covers all hole sizes, not only in 1/8" but in 1/16" increments, the duMont Corp., Greenfield, Mass., introduces this No. 1-A Kit. This useful com-



bination kit provides broaches and bushing for standard width keyways in 18 bore diameters conforming to American key standards. By interchanging broaches and bushings, 36 different combinations of keyways can be cut.
Circle Inform-A-Gram No. A7.

For Single Spindle Automatic Screw Machines, this drilling attachment will provide better concentricity and will eliminate drill whip up to 8,000 rpm. Made by the Drill-Tru Co., 5404 Alhambra Ave., Los



Angeles 32, Calif., the attachment is of tough durable hardened materials. Its capacity is from .004 to .125 drill sizes. Collets are used to insure the better concentricity. It is easy to install and is available in right or left hand drive.
Circle Inform-A-Gram No. A8.

Black Granite Layout Plates that are straight-sided are now being produced by the Collins Microflat Co., 2326 E. 8th St., Los Angeles 21, Calif. The surfaces of the layout models are finished to an accuracy up to 0.0002" per foot. These plates, being black granite, have no glare, are non-rusting, non-warping, non-deflecting, easily washable, smooth, temperature inert, rigid and moisture repellent. No oiling is required. Also, if accidently nicked, the surface accuracy is not impaired.
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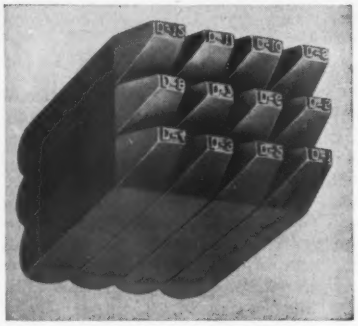
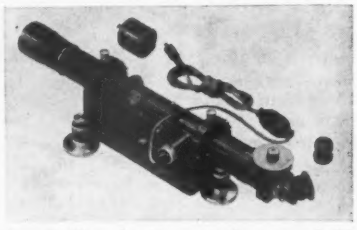


facture date have been introduced by the Parker Stamp Works, Inc., Hartford, Conn. Sets are available in 1/16", 1/8", and 3/16" character sizes or can be exactingly reproduced to customer specification by Parker craftsmen.
Circle Inform-A-Gram No. A9.

The Microptic Auto-Collimator for measuring the flatness of surface plates has been improved upon for greater precision and convenience in use. Among the new features are



4-volt illumination, an improved filter, a circular bubble in the base, supports for leveling screws, an improved scale, an angular eyepiece and a new method for quick setting. The instrument is available from the Engis Equipment Co., 431 S. Dearborn St., Chicago 5, Ill.
Circle Inform-A-Gram No. A10.

THIS "ZERO" EDGE LOCATOR is a precisely ground device designed to enable the jigborer operator to quickly locate the spindle over the work edge to "tenths". In use, the spindle is centered over the work edge by holding the locator on the edge by hand, with the indicator held in the spindle as usual. The indicator is then lowered into the center of the "Zero" along the work edge by moving the table at right angles to the edge. An additional advantage is that the operator can set the indicator to describe a perfect .5000" circle. The instrument is a product of Medelton Co., Inc., 335 E. 142nd St., Bronx 54, N. Y.
Circle Inform-A-Gram No. A11.

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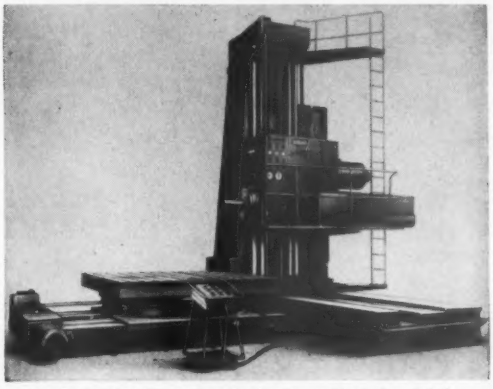
A Newly Designed 6¼" spindle diameter horizontal boring and milling machine with a gear drive for roughing and a belt drive for finishing is now being produced by American Schiess Corp., 205 E. 42nd St.,



New York 17, N. Y. Particularly suited for high speed machining with carbide tools. Machines are available in standard sizes for diameters of 6¼", 7½", 8⅞", 10⅜" and 12⅜".
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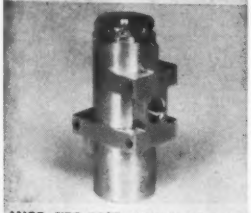
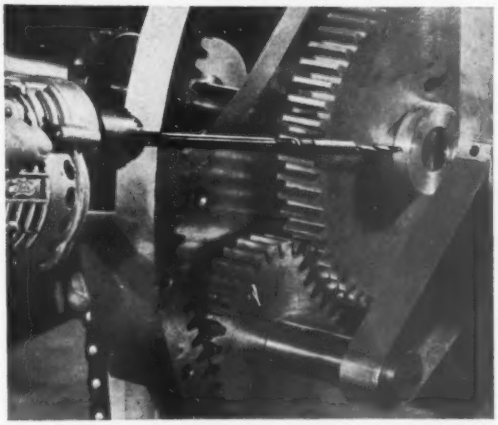


ANCO SIDE PORT HYDRAULIC RELIEF VALVE

Advantages of the Pressure Relief Valves developed by Anco, Inc., 1 Baker St., Dept. 54B, Providence, R. I. are that for both high and low pressure, the devices have only one moving part, is lightweight and easier to install. The newest line of valves include those of in-line design with internal or external adjustments or of side-port design with external adjustment and lock. Maximum free flow through valves is equivalent to the pipe size used. Valves are produced in both aircraft and standard pipe sizes.
Circle Inform-A-Gram No. A13.

A Versatile, New Drill Extension Rod and Chucks fitting over 52 small diameter drills without time consuming brazing or soldering operations has been developed by the Beaver Tool Co., Box 298, Huntington, Long Island, N. Y. The extension rod reduces the need for costly special length drills in hard-to-get-at drilling locations.
Circle Inform-A-Gram No. A14.



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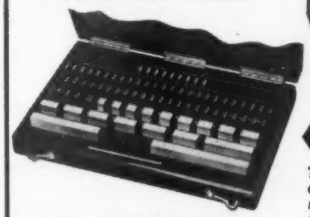

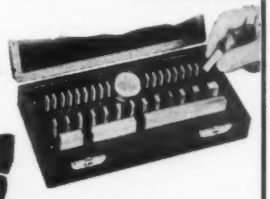

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These are designed for machine tools, jigs, fixtures, shift lever handles, etc. and give your product that "dressed up" appearance. Made in a wide variety of diameters and thread sizes. Steel ball handles are turned from bar stock. Highly polished. Low prices and the finest quality.
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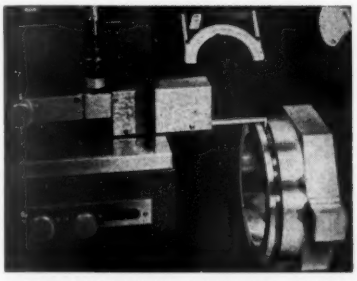
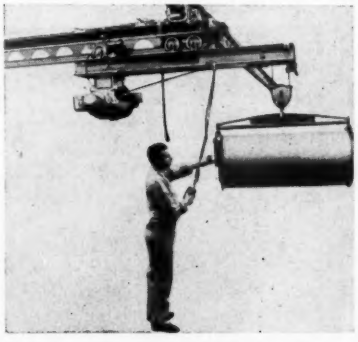
This New Mauser Vernier Caliper is made of stainless steel and the measuring surfaces are of maximum hardness without being brittle. The slide and scale are held to differ-

ent hardness assuring long life and minimum wear between the components. The scale is spread out so as to allow exceptionally easy reading. George Scherr Co., Inc., 200 Lafayette St., New York 12, N. Y., produces the calipers.
Circle Inform-A-Gram No. A15.



MICROMETRICAL MFG. CO., 345 S. Main St., Ann Arbor, Mich., announces its new Profilometer Type KB Tracer for measuring roughness across the bottom of flat-bottom grooves to ¼" depth and behind shoulders to ¼" height. When measuring crosswise, it permits 1/16" length of trace in grooves.
Circle Inform-A-Gram No. A16.

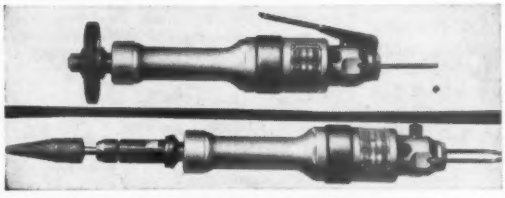
A New Type Overhead Carrier, with an cantilever arrangement that permits the unit to handle loads beyond the end of the crane on which it operates, has been developed by the Cleveland Tramrail Di-



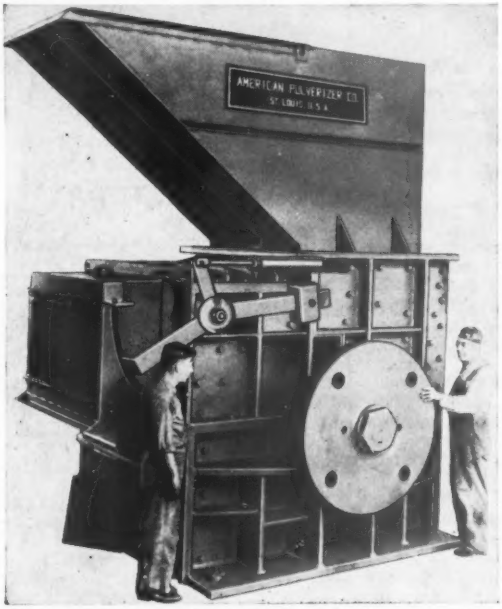
vision of the Cleveland Crane & Engineering Co., Wickliffe, Ohio. The carrier was designed especially to take care of situations requiring the handling of materials in areas between roof-supporting pillars that cannot normally be covered by cranes and also for reaching through doorways. The carrier has a capacity of 1500 pounds.
Circle Inform-A-Gram No. A17.

The New Dril-O-Driver converts all electric drills into speedy impact screw drivers. Manufactured by the

Drilo Corp., 201 East Carson St., Pittsburgh 19, Pa., this unit makes the driving of wood, machine, cap and sheetmetal screws plus bolts and nuts 10 times faster than the hand method.
Circle Inform-A-Gram No. A18.

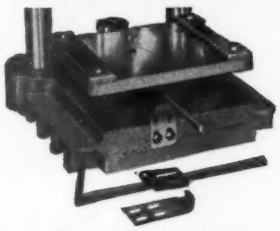


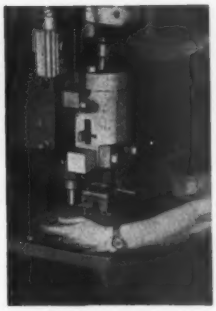
TWO NEW GENERAL PURPOSE GRINDERS, adaptable to die grinding and use with rotary files, cutters and midget mills, are being introduced by Buckeye Tools Corp., P.O. Box 966, Dayton 1, Ohio. Available with lock button or lever throttle, these spindle grinders take a 2-inch organic wheel and are offered with extension adapters for using mounted wheels. Weighing only 1¾ lbs., these compact grinders develop 50% greater horsepower than similar, larger tools.
Circle Inform-A-Gram No. A19.



This New Heavy Duty Metal Turnings Crusher is the largest ring metal crusher ever built by the American Pulverizer Co., 1535 Macklind Ave., St. Louis, Mo. It is designed to reduce metal turnings, aluminum castings and other forms of scrap at a rate of 35 to 50 tons an hour. **Circle Inform-A-Gram No. A20.**

Adjustable Automatic Stock
FEED STOP for DIES
Dahlstrom Light Duty
AUTOSTOP





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Tested and improved through the years, the Dahlstrom Autostop will save hours of your high priced labor. Adjustable to work with blanking, progressive and compound dies. Mounts on stripper plate in 15 minutes. Handles sheet steel up to 1/16" x 6" or equivalent weight.

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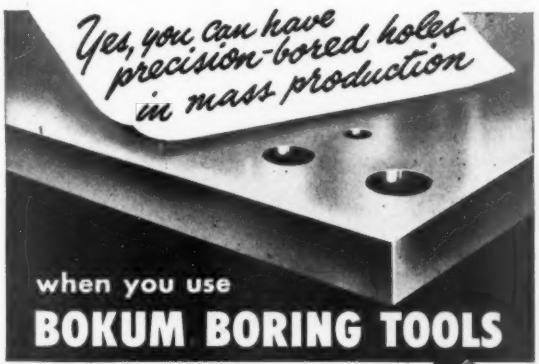

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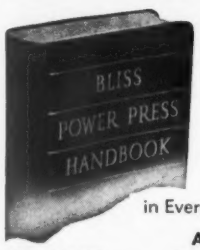

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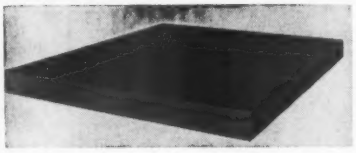
The New Model 11 Machine Tool Locating Microscope, developed by Perkin-Elmer Corp., Norwalk, Conn., can be attached to machine tools such as jigborers or vertical milling machines. It aids the machinist in

checking contours, slots and surface conditions that cannot be approached by mechanical devices or indicators. Model 11 magnifies 30x — great enough to observe work with .0001 tolerance. Its field of view includes a full ¼ inch of the workpiece. All table movements appear in their true direction when viewed through the eyepiece.
Circle Inform-A-Gram No. A21.

ADJUSTABLE FLOOR PLATES have been added to the line of precision equipment built by the Challenge Ma-



chinery Co., Grand Haven, Mich. They can be placed directly on the floor without any superstructure and can be leveled with adjusting screws through the top of the plate.
Circle Inform-A-Gram No. A22.

The Long and Short of precision-measuring versatility is best exemplified by the vernier calipers as large as 15 feet high produced by Alina Corp., 401 Broadway, New York 13, N. Y. In spite of their size, the large calipers will measure accurately to thousandths of an inch. The 15-foot calipers are used for checking large jigs, fixtures, machine tools, dies, etc. The one-piece solid steel blade of the big caliper reduces the margin of error. Calipers, any size, constitute an interesting study, and Alina's catalog tells you plenty about them and allied precision instruments.

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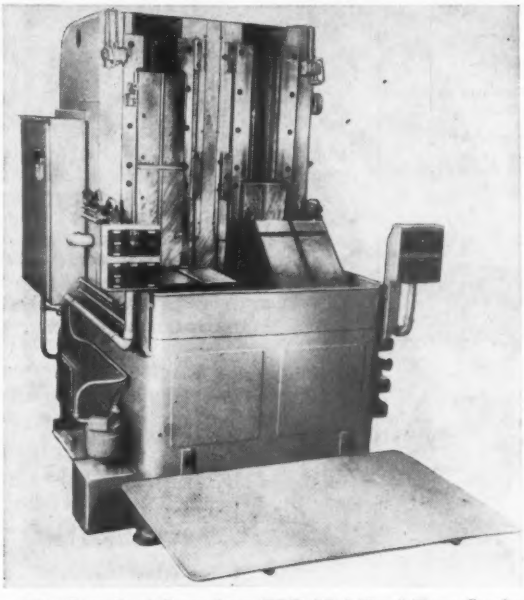
A New Type Tumbling Barrel, direct motor driven, is reported to be giving better work action for deburring and burnishing of all types of precision parts, both ferrous and non-ferrous. This tilting, flask-type tumbler is produced by the Globe Division of Hupp Corp., 1250 W. 76th St., Cleveland 2, Ohio. The machine may be employed with all types of deburring and burnishing media and is available in sizes for loads ranging up to 750 pounds. **Circle No. A24.**



The Standard American SBD-30-4 Dual Ram Surface Broaching Machine (30″ stroke, 4-ton capacity) is a new size that has been added to the standard line made by the American Broach and Machine Co., Ann Arbor, Mich. The machine works either automatically or semi-automatically.
Circle Inform-A-Gram No. A25.

Adjust-A-Leg Equalizing Slings for use on crane hooks have been improved upon by the Caldwell Co., Rockford, Ill. A new model of the sling will maintain a safety factor of 5 to 1 at a 45° angle and as much as 2/3's of the rated load may be carried on one leg without slippage. Another important feature of the new model is the easily adjusted locking device which enables the wire rope legs to frictionally lock in place—of special importance where repeated identical lifts are to be made.
Inform-A-Gram No. A26.

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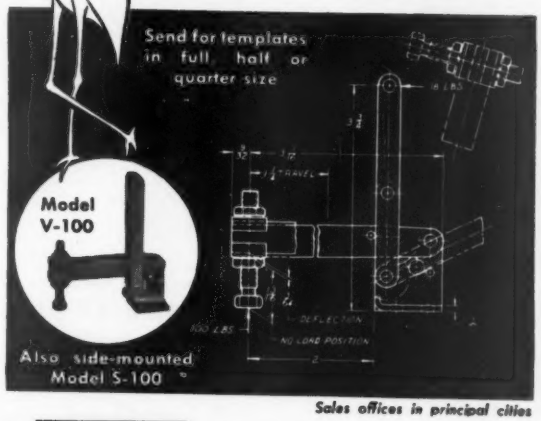

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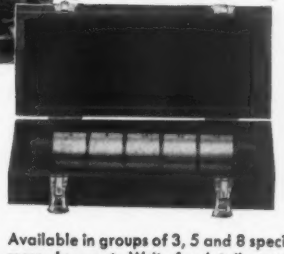

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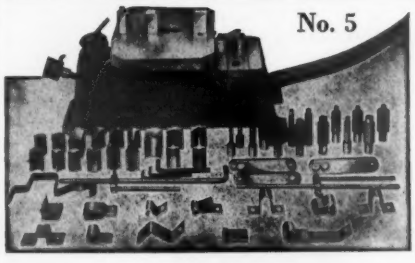

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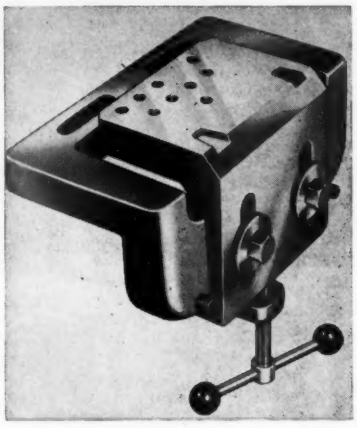
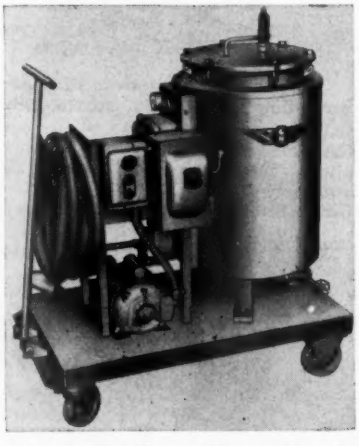
A New Adjustable Feed Mounting Adapter, introduced by the H. E. Dickerman Mfg. Co., 321 Albany St., Springfield, Mass., permits quick and simple adjustment of the stock



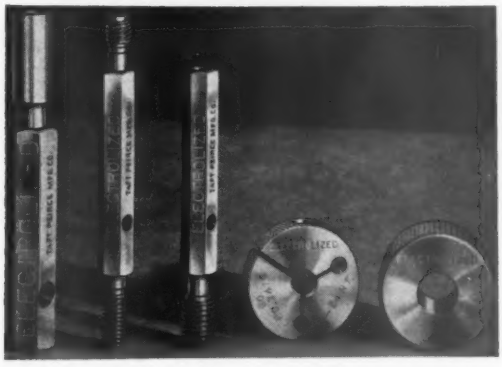
line feed with that of the die-plus alignment of feed with set edge of die. This eliminates the necessity of using shims and reduces set-up time. The device consists of a mounting base and feed mounting member already drilled and tapped to accommodate all sizes of feeds. **Circle Inform-A-Gram No. A27.**

A Portable Cartridge Filter, that goes wherever hydraulic, quench and other oils need cleaning, has been placed on the market by the Industrial Filtration Division, U. S. Hoffman Machinery Corp., 219 Lamson St., Syracuse 6, N. Y. Developed



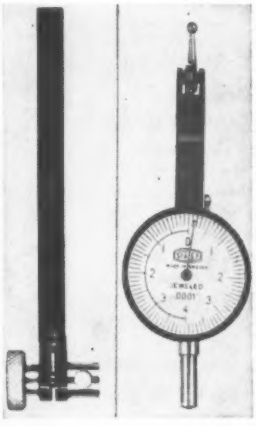
to bring filtration to the machine (or machines) which otherwise might not get such protection, this new Hoffman service aid is designed for one-man handling. A flexible hose with quick-connecting couplings permits a rapid hookup to the oil supply without interrupting the operation. The unit works on a recirculation basis for such time as is required to fully recondition the oil. **Circle Inform-A-Gram No. A28.**

Electrolized Gages have been added to the line of gages manufactured by the Taft-Peirce Mfg. Co., Woonsocket, R. I. In addition to characteristic durability,



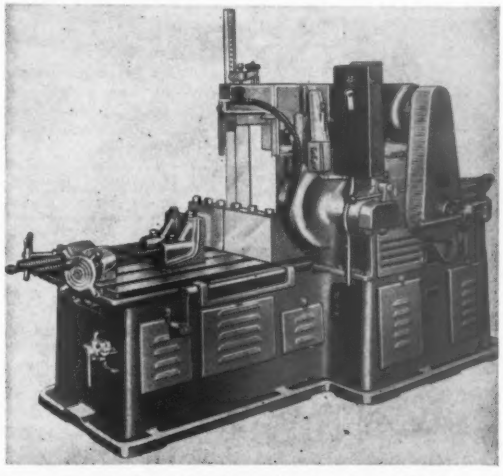
the surfaces of Electrolized Gages are so smooth as to reduce friction to a minimum besides having a high degree of resistance to corrosion. The surface will not chip, peel or spall under normal gaging conditions.
Circle Inform-A-Gram No. A29.

A Jeweled Bearing Vipp Dial Indicator, one that will give its users greater precision and far more accuracy in readings, is now available from Homestrand, Inc., Larchmont, N. Y., distributors of Swedish measuring tools and instruments. Furnished with a Universal Shank, shown at left of dial, the indicator is graduated in .0001. It is compact, versatile and adjustable to all possible positions. Its range is plus or minus 0-40-0 and for easier reading half the dial is in red.



Inform-A-Gram No. A30.

The Peerless Vertical Extra Heavy Duty Hydraulic Hack Saw Machine has been improved 150 per cent in efficiency due to recent improvements. Among the changes are a large hydraulic pump and improved feed



piston. For further details write Peerless Machine Co., 1600 Junction Ave., Racine, Wis.
Circle Inform-A-Gram No. A31.

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saves valuable times in tool-room and model shop by reducing set-up time and supplying correct speeds.

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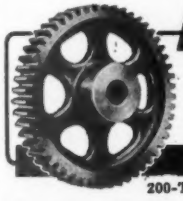

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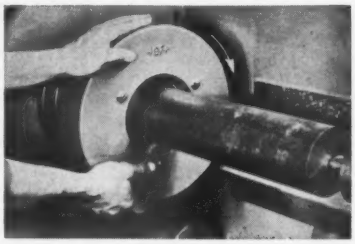


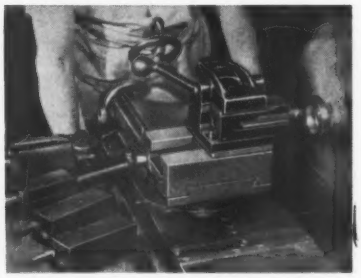
drivers with floating spring action has been obtained by the Skinner Chuck Co., 95 Edgewood Ave., New Britain, Conn. The work drivers are a replacement for work dogs.

Circle Inform-A-Gram No. A32.

THIS NEWLY PATENTED PRONG-TYPE TOOL called the "Brammertool" makes it much simpler to attach "V" Link Belting. A light pressure inserts ends of prongs into standard "V" link slots. Another easy twist opens up the slots so the rivet heads can be quickly slipped in or out to make or break connections in the belting. The tool was developed by the Brammer Corp., 684 Broadway, New York 12, N. Y.

Circle Inform-A-Gram No. A33.

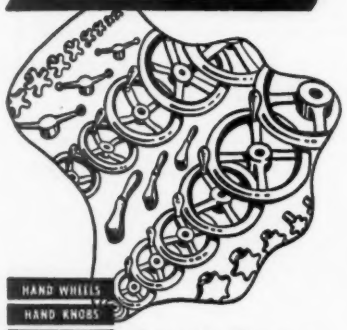
Use of the Master Tool Post and Tool Holders developed by Bakewell Products, 1128 Mission St., S. Pasadena, Calif., has resulted in important savings for lathe users. The biggest advantages of the unit are its quick-grip and release feature



that enables cutting tools to be exchanged in a fraction of the time now required. A "T" block that fits into the lathe compound or carriage "T" slot makes securing the massive heavy-duty tool post an easy task. Special design and simple riser plates for vertical spacing quickly adapt the holder to any lathe.

Circle Inform-A-Gram No. A34.

Tomco



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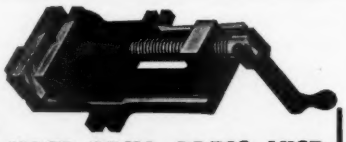

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This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

OFFERED IN TWO SIZES

Vise No.	Width of Jaw, Inches	Opens Inches	Weight Pounds
1D	3½	4	12½
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BOLSTER & T-SLOT TYPES
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Forged, precision machined heat treated. Tensile strength 150,000 lbs.

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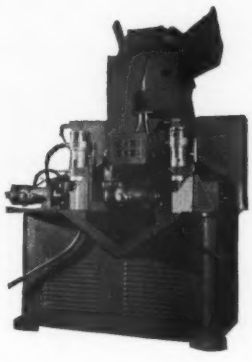
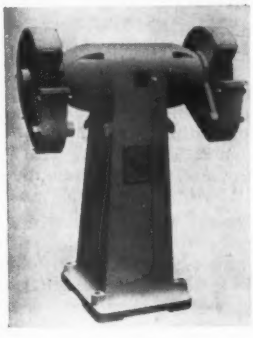


3,000 Pieces Per Hour is the production capacity of this new drilling and deburring machine designed principally for second operations on screw machine parts up to 1″ diameter and 2″ long with drilling holes at any desired angle. A product of the Inter-Lakes Engineering Co., 4845 Belevue, Detroit 7, Mich., the machine has a double feed and operates automatically. The only attention required in operating is to keep the hopper filled.
Inform-A-Gram No. A35.

Here Are a Few of the Broaches designed for special engineering by the du-Mont Corp., Greenfield, Mass. (1) Pull-type broach, (2) single pass pull-type, (3) another single pass full-type broach, (4) broach for use in Davis or similar type keyseating machines, (5) push-type square broach, (6) push-type for squaring both ends of elongated hole in one action, (7) push-type production keyway broach, (8) push type square broach with round pilot, (9) push type for sizing 4 sides of rectangular hole in one operation.

Circle Inform-A-Gram No. A36.

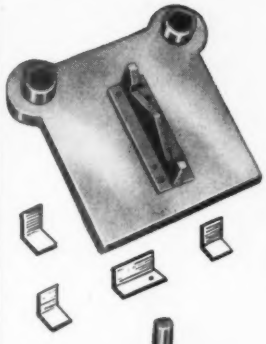


British Polishers and Grinders are being introduced to the American market by the Stamford Works of London, England. The machines are of sturdy, solid construction, yet offer smooth, vibrationless operation. They are provided with extra large shafts to carry all kinds of loads. Technical information will be furnished on request from Newage International, Inc., 235 E. 42nd St., New York, N. Y. **Circle No. A37.**

A New Explosion-Proof heavy duty limit switch, designed for use on all types of machinery and industrial equipment in explosive gas or vapor-air atmosphere, has been developed by the Micro Division of Minneapolis-Honeywell Regulator Co., Freeport, Ill. It is listed by Underwriters' Laboratories as suitable for hazardous locations of Class I, Group C and D. The switch may be adjusted for use in any of four horizontal positions. It is claimed that this is the smallest explosion-proof snap action switch available. **Circle No. A38.**

Punches and Dies

Angle Iron Cut Off Die



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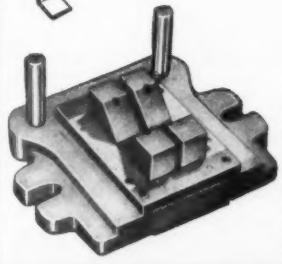

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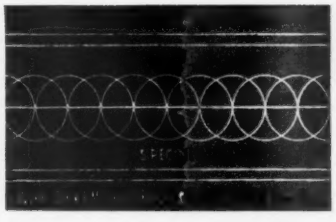

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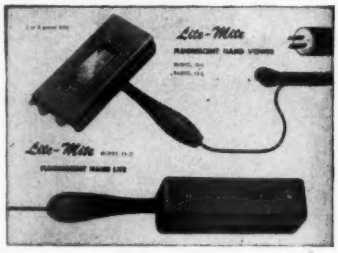
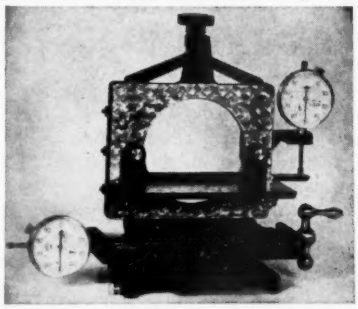


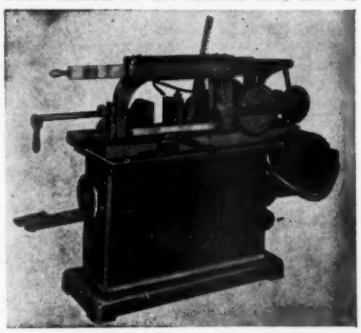
light source, designed primarily for use wherever close viewing is necessary, the units are manufactured by Stocker & Yale, Inc., Marblehead, Mass.
Circle Inform-A-Gram No. A39.

A New Coordinate Measuring Stage for use on Bench Optical Projectors has been developed by the

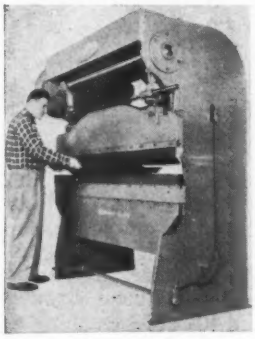


Portman Instrument Co., Inc., 6 Manhasset Ave., Port Washington, N. Y. The stage can be used on any Optical Comparator and will give 1" longitudinal travel, 1" vertical travel and 1" focusing travel.
Circle Inform-A-Gram No. A40.

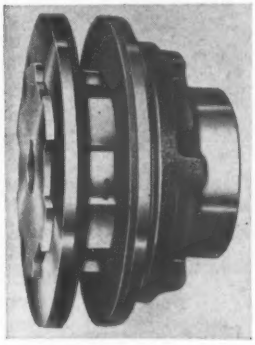
A New Power Hack Saw with a capacity of up to 7" x 7" and with a quick acting swivel base vise that operates to a 45 degree angle has been added to the Keller line and is



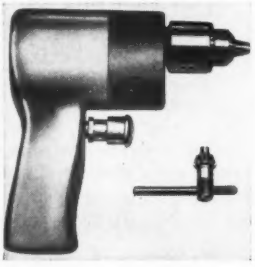
available from the Sales Service Machine Tool Co., 2363 University Ave., St. Paul, Minn. The saw has two speeds of 80 to 140 strokes per minute and requires a floor space of only 17 x 51 inches.
Circle Inform-A-Gram No. A41.



A new 6' and 8' Sheet Metal Forming Power Press Brake is now being manufactured by the Service Machine Co., Inc., 506 Miller St., Elizabeth 4, N. J. Among the features of the brake are accurate ram and welded steel frame, precision adjustment of ram, balanced cast steel flywheel that runs on ball bearings and adjustable variable speed drive with 1½ hp. motor. **Circle A42.**

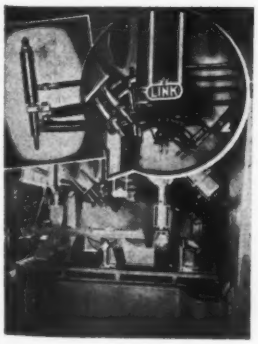


Adjustable Torque-Limiting Clutches that provide overload protection for machine drives in a wide variety of equipment are now being produced by Morse Chain Co., 7601 Central Ave., Detroit 10, Mich. These compact slip-type friction clutches act as automatic shear pin mechanisms and avoid the time and labor required to insert new shear pins. **Circle A43.**



THIS NEW ¼" PNEUMATIC DRILL is a recent development of the Brown Tool Mfg. Co.,9422 Trenton Ave., St. Louis, Mo. Among some of its advantages are a rpm of 2,600, an 8—vein motor that produces a high torque on very low pressure and a light weight of only two pounds. The drill will perform at pressures as low as 28 pounds. Circle A44.

Oil Jet Centers, made by Tool Service, P. O. Box 10265-D, Tampa 9, Fla., come with their 60° points tipped over the full length with either high speed steel or cast alloy. They are accurately ground with the shanks made of tool steel and unhardened. Grease cups have either seals or close-fitting threads to prevent leakage. **Circle A45.**



A Point Holder, applicable to standard types of transformer cables, is now being produced by Link Welder Corp., 13684 W. Buena Vista, Detroit 27, Mich. The holder is of a two-piece construction to permit replacement of either the contact plate or shank. It is also applicable to gun mounting. Shanks are available in lengths to permit the use of one welding electrode length. **Circle A46.**

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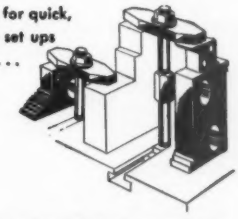
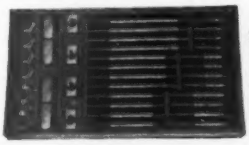


and

HANDY STUD SETS



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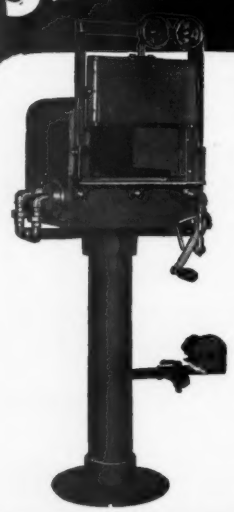

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ABC System of Limits and Fits

A draft proposal for an ABC System of Limits and Fits has been published by the American Standards Association for the information of American industry. This is announced in the May issue of the ASA magazine, STANDARDIZATION, in an article explaining the background of the ABC proposal.

At a conference held in New York in February 1953 the proposed ABC System was unanimously approved by delegations from the United States, the United Kingdom and Canada as the basis of such national standards for Limits and Fits as each of the three countries might decide to establish. The American delegation consisted of members of ASA Committee B4, on Tolerances and Allowances for Cylindrical Fits and Limit Gages, representing American industrial organizations, and representatives from the Armed Forces. The British and Canadian delegations were also made up of representatives of the national standards bodies in the United Kingdom and Canada, and their military services.

In 1925, a Tentative American Standard, Tolerances and Gages for Metal Fits, B4.2-1925, was approved by ASA. This tentative standard contained tables for eight classes of recommended fits. In 1947, B4a-1925 was partially revised, but the new standard, B4.1-1947, Limits and Fits for Engineering and Manufacturing, does not contain tables of fits. It was indicated that this information would be given in a second part still to be developed.

According to the announcement, American industry should expect soon to be canvassed on two questions:

(1) Does industry want American Standard tables of recommended fits?

(2) If so, should such tables be based on the ABC Proposal?

Copies of the "Draft Proposal for an ABC System of Limits and Fits" are available from the

. . . *Continued on page 147*

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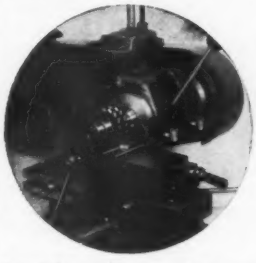

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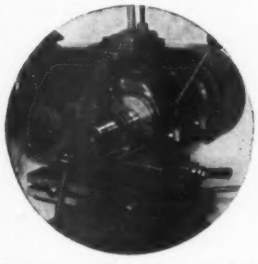

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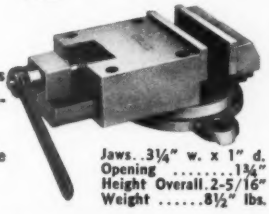

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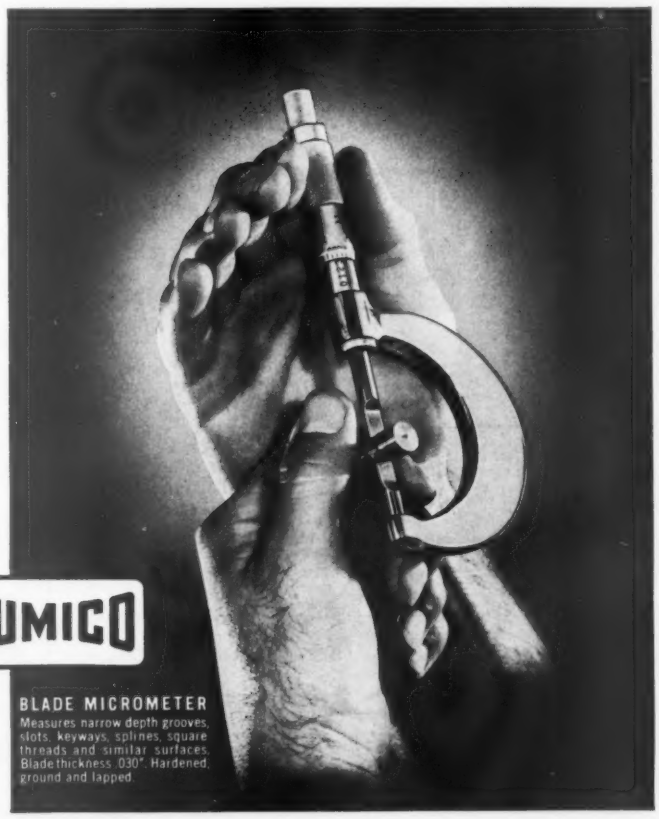
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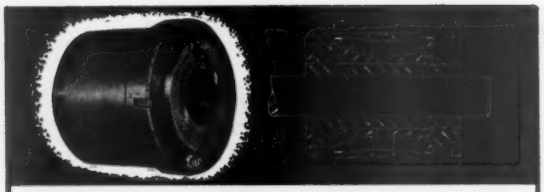

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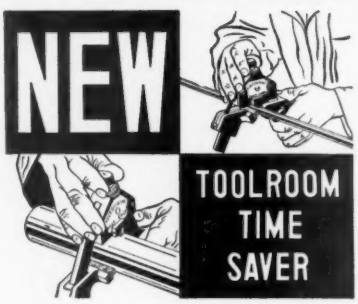

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Early delivery.

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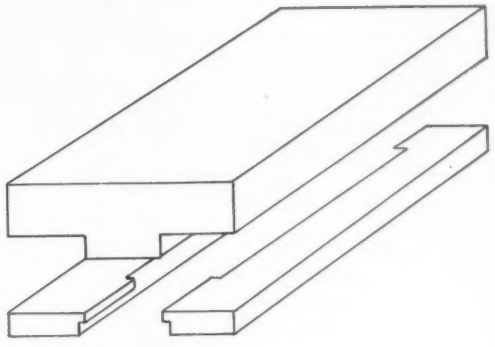
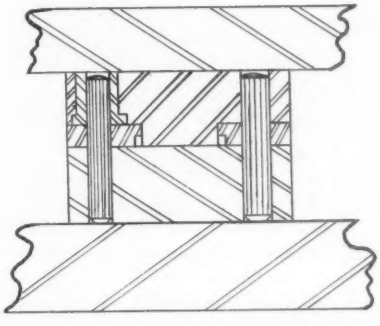
260 WEST ST., NEW YORK 13, N. Y. CAnal 6-4937

. . . Strippers and Stock Guides, from page 41

locations are jig bored and if necessary jig ground just as all essential holes in the stripper and die block are machined.





Extended stock guides with overhanging ledges are best suited for this type of companion to the stripper. Here again all the accuracy would be lost if the guides were not exactly built to the correct height in relation to the center step of the stripper and stock thickness.

Industry News

The Landis Machine Company, Waynesboro, Pa., announces the relocation of its Chicago and Cleveland Offices.

The Chicago Office, under the supervision of Paul A. Reynolds, District Manager, is now located at 6920 W. North Avenue, Chicago 35, Illinois.

The Cleveland Office, under the supervision of E. O. Peiffer, is now located at 13967 Cedar Road, Cleveland 18, Ohio.

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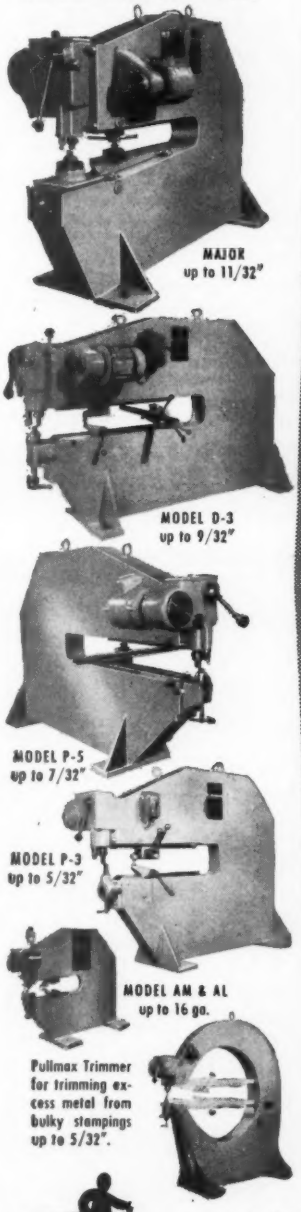
does all these operations

Save time, labor and expensive dies. Choice of 9 sizes and capacities to work from 16 ga. up to 11/32" thicknesses. Quick changing attachments. Works all steel and non-ferrous metal.

ALL OF THESE PULLMAX MACHINES . . .


MAJOR up to 11/32"
MODEL D-3 up to 9/32"
MODEL P-5 up to 7/32"
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MODEL AM & AL up to 16 ga.
Pullmax Trimmer for trimming excess metal from bulky stampings up to 5/32".

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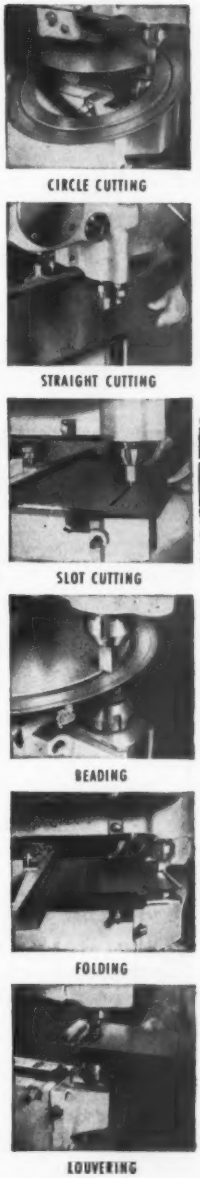

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470 REAMERS ARE CARRIED IN STOCK VARIATIONS OF .001

▼ Sizes from .032, .033, .034, .035, .036, etc., all the way up to .501. Any size required larger than .501 . . . blanks can be ground to your exacting specifications, delivered in 3 or 4 days. By purchasing SUPEREAM Reamers in steps of .001 you SAVE time, labor and money in the cost of extra machining and lapping.

▼ SUPEREAM Reamers all have ground and polished flutes and are held within .0002 tolerance. Reamers are also furnished in Right-hand spiral, Right-hand cut, as well as Left-hand spiral, Right-hand cut. These are delivered in 3 to 4 days.

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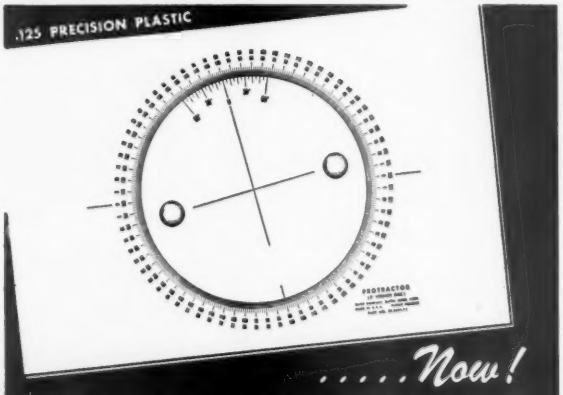

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Optical Comparator Protractor

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Thru 1½" Steel Plate!

With The New Heavy Duty "TAP KING" Tapping Attachment

This rugged miracle worker weighs only 18 Lbs.—yet can tap through a 1½" steel plate with ease and accuracy.

Unusual finger tip sensitivity, smooth, powerful driving power and rugged vibration free construction—enables operators to hold close tolerances on exacting large hole production jobs. Special design minimizes costly parts spoilage, tap breakage and drastically reduces operator fatigue. Some users report production gains of 50% on open hole tapping in high carbon steel forgings and 100% increases on blind hole tapping in steel castings. Here's why: New exclusive heavy duty 17-tooth spline drive from clutch to tap holder assures RIGID & SMOOTH ACTION; increases accuracy and uniformity, reduces strain, wear and vibration. Spindle support at both ends eliminates tap wobble; double-cone friction clutch provides sensitive finger tip control; reverse speed is twice forward speed; has many other unusual features.

NEW "TRU-GRIP" Tap Holder

Lighter, smaller, affords easier tapping close to walls or shoulders.

Write for FREE BROCHURE

Giving full particulars on the New Tap King and the complete line of Tapping Machines.

PROCUNIER Safety Chuck Company

12-14 S. Clinton St., Dept. 8, Chicago 6, Ill.

. . . ABC System, from page 142

American Standards Association office (70 East 45 Street, New York 17, N. Y.) at 75 cents a copy. Copies of the article entitled "Does Industry Want American Standard Tables of Recommended Fits?" (reprinted from STANDARDIZATION, May 1953) are available at 25 cents a copy. The two documents give a complete picture of the status of the ASA project on Limits and Fits and its relation to ABC unification.

Microturn Allows Finer Adjusting

A lathe attachment has been developed which allows the operator to accurately adjust to and hold tenths of thousandths on inexpensive equipment. Further, this highly accurate control can be operated by inexperienced workers.

The attachment is known as the Microturn and according to its manufacturer can be mounted

Photo courtesy Leon G. Arpin Co.

easily on anyone of nine different lathe models in 30 minutes.

While the ordinary dial of the lathe cross slide is divided to read in thousandths of an inch, the Microturn is graduated in tenths of thousandths. A turn of one division on the conventional dial advances the lathe tool one thousandths of an inch into the work, while one division of the fine Microturn advances the tool one-tenth as far.

Microturn uses an 80-pitch thread completely encased in thrust and needle bearings instead of the coarse 8 or 10-pitch thread used on the normal feed screw. This 80-pitch thread advances the tool .0125 inches forward per revolution as compared to the .125 inch movement for each turn of an 8-pitch thread.

The complete installation results in a practical built-in micrometer reading in tenths of thousandths.

De-Sta-Co Toggle Clamps are extremely flexible in their application and are economically and easily adapted to work-holding fixtures for assembly, welding, bonding, machining or other production processes. Smooth, fast, powerful clamping action clamps parts quickly . . . holds them firmly in perfect alignment . . . releases instantly for easy removal and insertion of new workpiece.

De-Sta-Co clamps are engineered for rugged use in production; reamed bearing holes insure precision fit, long life and sensitive operation . . . offsets in handles and links relieve friction . . . made with cold drawn bars, and forged portable clamp parts. Accessories for adapting clamps to specific applications are available.

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81-30

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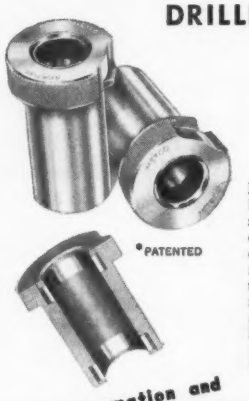
MICRO-DRILL PRESS

for holes as small as .002"

Designed to hold small drills in precision collets. Absence of a sliding quill guarantees extreme sensitivity with finger-tip control. A mounted ½" capacity drill chuck can also be used.

Write for Bulletin H describing the Micro-Drill Press and listing collet sizes. Louis Levin & Son, Inc., 782 E. Pico Blvd., Los Angeles 21, California.

INCREASE PRODUCTION.. SAVE TIME & MONEY ON YOUR DRILLING OPERATIONS



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Carbide Inserted Bushings last longer, cost less in the long run

Here is a bushing that combines the best features of steel and carbide; the strength of steel and the long life of carbide. First cost: slightly higher than ordinary steel bushings; their life: many, many times as great. In addition to such obvious savings, MEYCO bushings increase the life of drills and reamers, produce accurate work for a longer period of time, save on machine-down time and on nonproductive man-hours.

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Featuring: automatic feeds, end release and return; adjustable stop; adaptable to all standard machines; highest precision; ideal for jig borers; nine models for work up to 36¼" diameter.

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Replace scriber with dial indicator and Micro-Height Gauge measures center distances between holes or surfaces. As indispensable as a micrometer to toolmakers, layout men, and inspectors.

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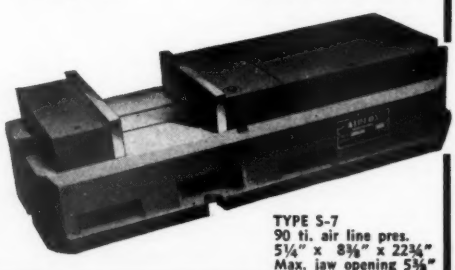

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90 ti. air line pres.
5¼" x 8⅜" x 22¾"
Max. jaw opening 5⅜"

FOR PRODUCT INFORMATION USE CONVENIENT INFORM-A-GRAM CARD

Low Cost Stretch Press Forms Faster

Development of an advanced type stretch-form press, for fast and accurate forming of aluminum alloy extrusions and sheets, was recently announced. Reports indicate that the new machine will usually occupy about 25% of the floor area and cost about 20% as much as previous machines capable of performing the same operation.

Known as the Peterson press, this versatile machine performs stretch-leveling, pre-forming, wrapping, skin pressing, bending, forming, and stretch-pressing of many different parts to double curvatures. Rated at 100 tons, the press will accommodate work pieces from 6″ to 30′ in length, depending upon the particular operation and the cross-section and nature of the material. Once the press

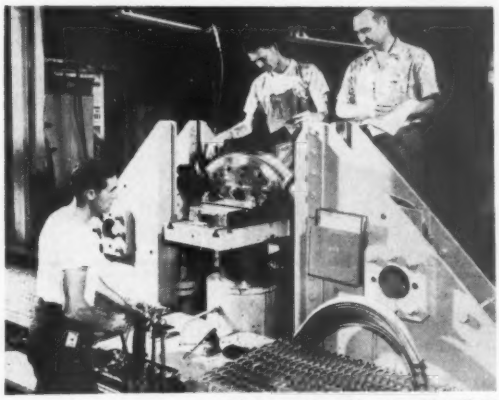


Photo courtesy of Longren Aircraft Co.

is set up, floor-to-floor time is as fast as two minutes but is influenced by the size and shape of the workpiece.

The hydraulic system includes two vertical and two horizontal cylinders, and a center main-ram cylinder, all of double-action type. These cylinders can be used in combination or separately for extreme flexibility in forming.

Material to be formed is laid over the forming die and gripped by chucks. By selection of various combinations of cylinder movements, the die can be made to ascend or descend vertically, the chucks can move vertically and horizontally — either closer together or farther apart — stretching the material beyond its elastic limit until it assumes the shape of the die. Parts are formed without springback and no hand finishing is required.

Industry News

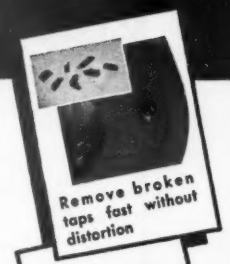
Staffed by personnel whose accumulated experience totals 30 years of work in the stress analysis field, the Weber Instrument Corporation Testing Laboratory, Detroit, is now available to serve industry.

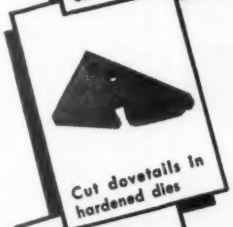
Members of the laboratory staff number some of the most capable engineers and technicians in the field.

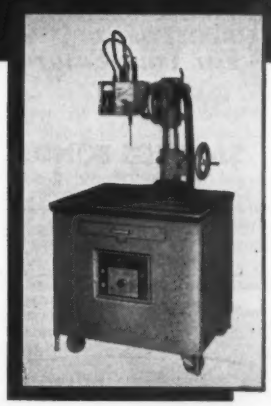
Equipment for complete physical testing is available and services include not only strain gage and stresscoat work, but also vibratory fatigue testing and dynamometer testing.

METAL DISINTEGRATION

and what it can do for you







Literally hundreds of thousands of dollars are saved annually by corporations that are using Metalmasters in just tool and die repair alone.

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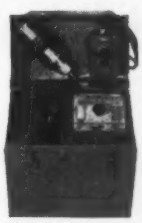

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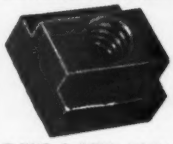

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Industrial News

Elevation of Brig. General Stanley E. Ridderhof, U.S.M.C., det., to vice president of Rosan Inc. Newport Beach, Calif., has been announced by Jose Rosan, President.

General Ridderhof has been serving the firm, producer of positive locking inserts and studs for industrial and military use, as assistant to the president.

One of the Marine Corps' earlier aviators, he was former Commanding officer of El Toro Marine Air Station. Prior to that he was chief of staff of General L. E. Woods, commander, Marine Air, West Coast.

General Ridderhof retired in 1949 after 32 years of service.

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Any decimal diameter to ½"—in any length. Mirror finish surface to gage tolerance. Many uses — punches, gages, measuring wires, special tools, etc. Quick delivery.

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Saves time, eliminates diamond dressing. Cones changed in seconds. Available in 2 sizes, 3/8" and 3/4" Cent-R-Laps and abrasive cones in leading grits.

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for electrical marking on soft or hardened steel, alloy steels, or other ferrous materials. Excellent for marking finished and ground surfaces.

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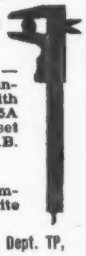

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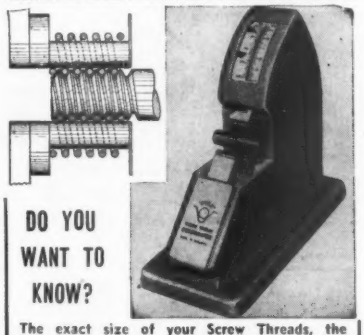
THE O K TOOL COMPANY, Milford 8, New Hampshire

. . .Conveyor Moving, from page 113

conveyor that carries it to a point where a 2,000 PSI hydraulic cylinder (B) with a 11″ bore x 84″ stroke operates in conjunction with a special tilting mechanism to tilt the coil on its side. The coil now at rest on a dolly at the end of this conveyor is lifted a few inches by a pendulum mounting mill type 2,000 PSI hydraulic cylinder (C). The dolly is pulled down on one of three gravity conveyors feeding the entry end of the pickle lines by a 2,000 PSI hydraulic cylinder (D) with a 8″ bore x 288″ stroke, one of the longest stroke single piece cylinders ever built. Three foot mounted mill type 2,000 PSI cylinders (E, F, G) with 5″ bores x 96″ strokes push the coil off the dolly on to the desired gravity conveyor.



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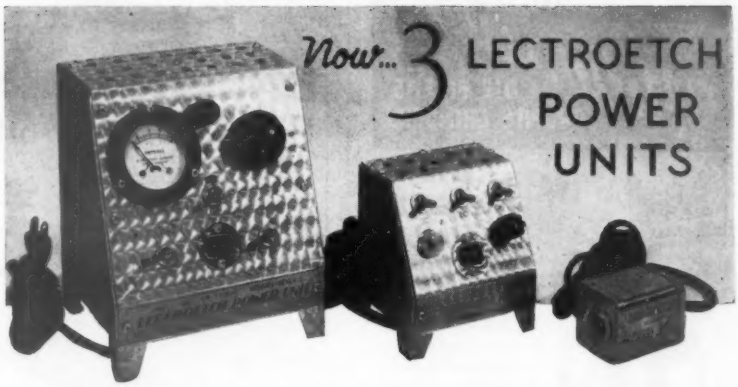

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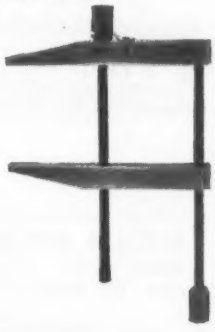

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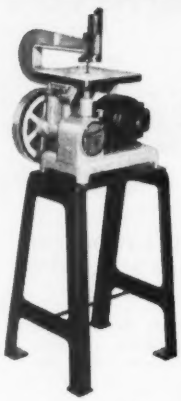

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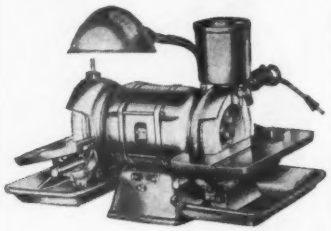

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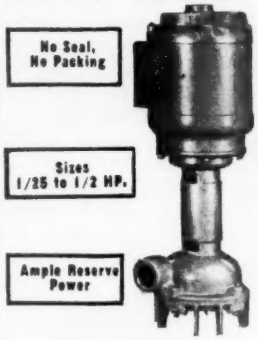

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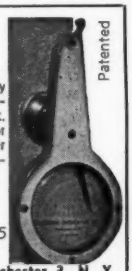

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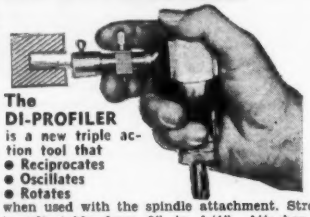

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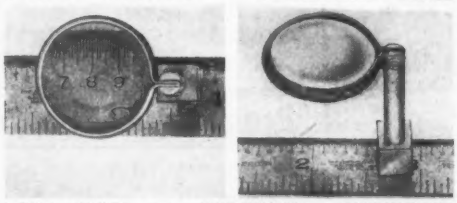

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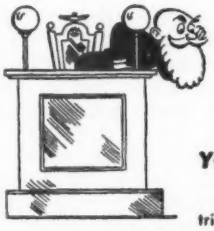

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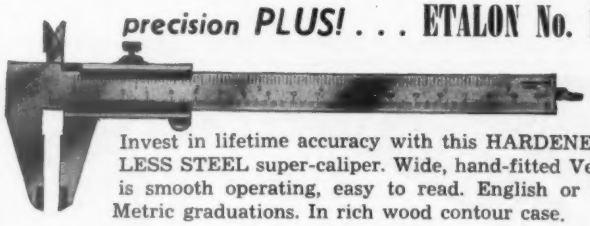

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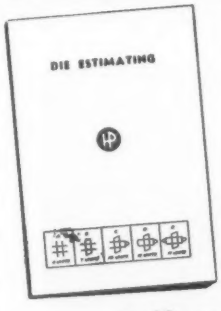

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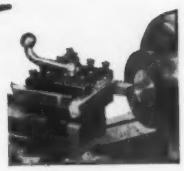

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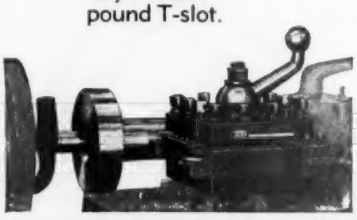
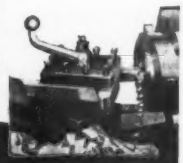


Same tool used for inside chamfer merely by indexing back two positions or 60°.



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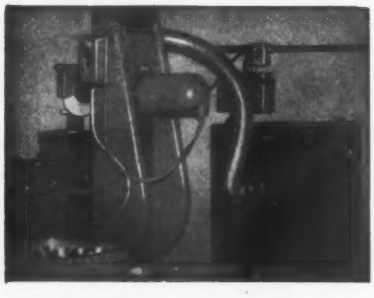
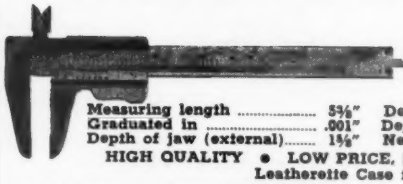


Precision Vernier Calipers



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. . . Carbide, from page 100

sert carbide tool of Grade K6, actuated by an improvised tracer attachment. The style TBR-86A carbide tool is held in a sliding tool block on the left tool ram. At the back of the tool block, a cam follower which maintains contact with a template permits the tool to cut the required profile on the pipe joint's side.

Feed rate for the rough profile cut is 0.031-inch with0.020-inch for the finish cut. Maximum depth of cut is 3/16-inch on roughing and 1/16-inch on finishing. On that portion of the profile where stock exceeds 3/16-inch a second roughing is taken. Drive belt slippage prevents utilization of higher speeds and feeds.

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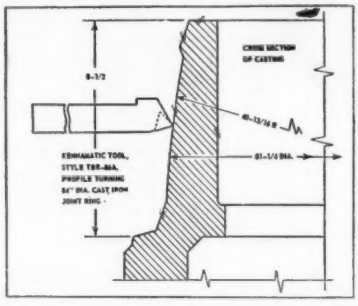
Tool life on the profiling operation is three to four pieces per cutting point. With three new cutting edges available on each end of the triangular car-



bide insert, 18 to 24 rings are profiled before the insert requires any regrinding.

Prior to the profiling operation, standard style BR-24 brazed tool was used to rough turn excessive stock from the ring's outside diameter. This tool is run at the same speed and feed as the profiling tool but depth of cut varies from nothing (0-inch) to ½-inch due to run-out of the rough casting. One to two rings are rough turned per grind.

Boring the inside diameter and facing of the ring's top is done with a standard style BLH-24 clamped tool at 0.031-inch feed and up to ½-inch depth of cut. Tool life on this operation is three or four pieces. After the inserts become too short for effective clamping they are utilized as tips for the style BR-24 carbide tool which is used for rough turning the outside diameter.

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ADVERTISERS INDEX

GET DUMORE

the drill head with automatic built-in controls

Self-Contained Air

No cumbersome air lines to hook up. Simply plug into electrical outlet. Built-in rotary air compressor advances drill at *required* speed and feed for *new resistance drilling.*

New Resistance Drilling

Provides completely automatic operation. Self-compensating control of drill by combined action of Air Feed Pressure Regulator and built-in return spring allows material being drilled to govern rate of drill feed and speed.

Adjustable Stroke Control

Select depth of stroke by adjustable stop nuts. Allows *measured depth* drilling from 1/32" to 1 1/8". Can be controlled to .004" preciseness.

Air Feed Pressure Regulator

Permits adjustment of pressure up to 15 P.S.I. Allows for variation in drill size. This simple control governs rate of drill advancement in work.

Automatic Chip Clearance

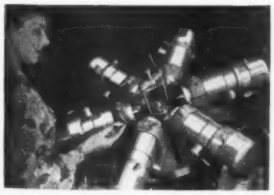
Depth Staging feature provides retraction of drill at proper intervals for chip clearance. Prevents drill breakthrough, practically eliminates costly drill breakage.

Maximum Drilling Production

Automatic operation of drill allows free use of operator's hands. Fast, one-time setup makes this machine ideal for simultaneous operations.

. . . . . and get all these cost reducing benefits

Motor manufacturer doubled output on armature shaft drilling. Decreased drill breakage 25 times.



Unusual setup drills bronze nozzle holders. Labor costs slashed $75 on first run of 5273 pieces.

Sound equipment manufacturer cashed in on big savings. Cut drill breakage to the bone.

WITH the Dumore automatic drill head, you can say goodbye to excessive drill breakage, down time and scrap loss on small diameter, deep hole drilling. And just as important, you *increase* drilling capacity.

Get all the information about this revolutionary tool. Ask for demonstration. See how it eliminates operator guesswork and provides completely automatic control, flexibility of setup, big cost reductions at desirably low cost.

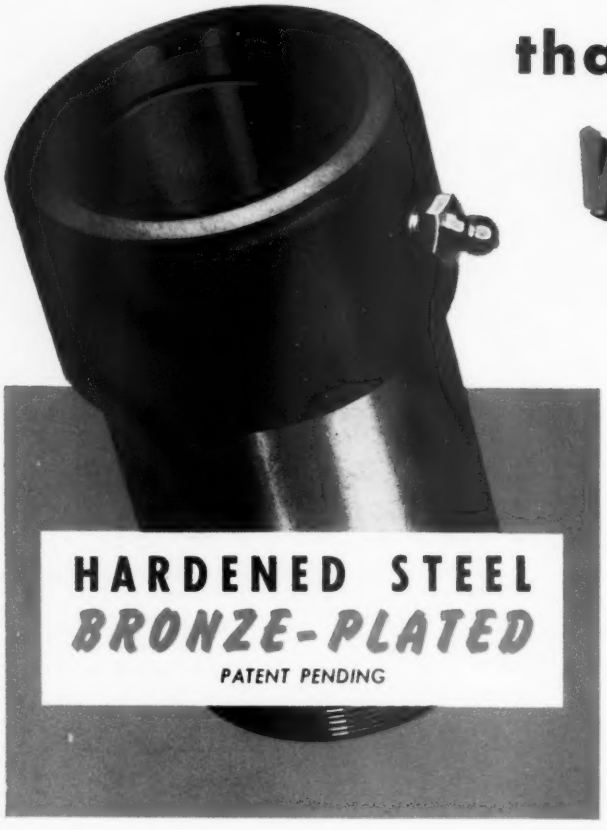
Call your distributor today, or write for bulletin.

DUMORE PRECISION TOOLS

The Dumore Company

1313 Seventeenth Street • Racine, Wisconsin

Now a long-wearing GUIDE-PIN BUSHING that WON'T SEIZE OR SCORE



Lamina Guide-Pin Bushings combine the long wearing of hardened steel with the free, smooth glide of bronze. No more seizing or scoring from hardened steel running on hardened steel . . . no more out-of-round wear characteristic of soft non-ferrous bushings . . . Lamina Bushings provide the answer to long, seize-free bushing service in punch and die shoes.

Lamina Guide Bushings are made of hardened steel with .001" to .002" of bronze electro-plated on the inside diameter. In addition to this, an oil groove, 5/32" wide is machined into the inside wall in a figure eight pattern. Each bushing is furnished with an alemite fitting for lubrication of the oil groove.

In actual use on hundreds of Lamina-built dies, in laboratory tests under conditions far more severe than shop conditions, these bushings without exception have proven absolutely trouble-free in service.

Stocked in a variety of sizes and lengths for straight pins, shoulder pins or removable pins. Specials made to order. **Lamina Dies & Tools, Inc., 14925 W. Eleven Mile Road, Berkley, Michigan.**

FREE BULLETIN

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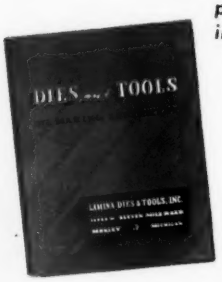

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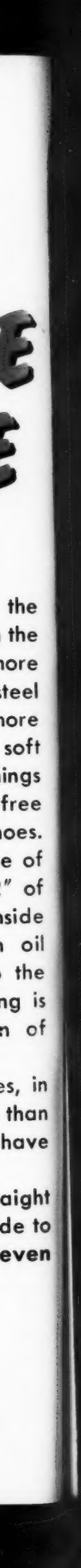
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